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NUCLEAR SCIENCE ABSTRACTS

Volume 10 September 15, 1956 No. 17 Suppl.

BIOLOGY AND MEDICINE

RADIATION HAZARDS AND PROTECTION

7108 AECD-4075
[Los Alamos Scientific Lab., N. Mex.]
MONITORING OF CERTAIN PERSONNEL FOR INTERNAL PLUTONIUM CONTAMINATION. W. H. Langham, A. Murray, III., A. M. Perley, and R. W. Mattison. Aug. 17, 1945. Changed from OFFICIAL USE ONLY with deletions Dec. 10, 1955. 25p. Contract [W-7405-eng-36]. $4.80 (ph OTS); $2.70(mf OTS).

A detailed report is given of the method of determining body internal contamination with plutonium. This method consists of wet-ashing a 24-hour urine sample, extracting the plutonium with cupferron, plating and counting the plate in a proportional alpha counter. Results are presented which were obtained by assaying urine samples from 76 members of the chemistry personnel. These results show that, to date, only the recovery step in processing plutonium has presented a serious health hazard. The results also show a qualitative correlation between the number of high nose counts recorded for an individual and the degree of internal contamination indicated by urine assay. When the individuals were classified into zero- or low-exposure, moderate-exposure and high-exposure groups the difference between the urine counts of those with moderate and high exposure was definitely significant. The difference between the values for the moderate- and low-exposure groups was of doubtful significance. (auth)

7109 NAA-SR-Memo-195
North American Aviation, Inc., [Downey, Calif.].
RADIOLOGICAL HAZARDS OF THE AIR SURROUNDING THE LPR. R. L. Ashley. Feb. 15, 1952. Decl. Mar. 23, 1956. 10p. $3.30(ph OTS); $2.40(mf OTS).

One of the problems arising from the design of the LPR is the production of A^{41} by neutron capture of the A^{40} present in the air. Calculations are made for both the transient and steady states. It is suggested that excessive air activity might be corrected either by sealing the inside of the reactor or by operating with the air in the reactor at a negative pressure. (B.J.H.)

7110 ORNL-1381(Rev.)
Oak Ridge National Lab., Tenn.
A REVIEW OF A POLONIUM CONTAMINATION PROBLEM. Dixon Callihan and Don Ross. Aug. 12, 1952. Decl. Mar. 23, 1956. 15p. Contract W-7405-eng-26. $0.20(OTS).

This report describes an incident in which about seven curies of Po from a Po–Be neutron source were spilled in an Oak Ridge laboratory. The decontamination procedures which were followed are described and the clinical findings of one person who was significantly exposed to Po are given. There is no evidence of any permanent personal damage. (auth)

TOXICOLOGY STUDIES

7111 M-38
[Madison Square Area, Manhattan District, New York.]
TOXICITY OF VANADIUM IN INDUSTRY. J. L. Ferry. [nd]. Decl. Nov. 28, 1955. 8p. $1.80(ph OTS); $1.80 (mf OTS).

Literature on the industrial hazards from vanadium is surveyed. (B.J.H.)

TRACER APPLICATIONS

7112 AECD-4207
Hanford Works, Richland, Wash.
PERCUTANEOUS ABSORPTION OF TRITIUM OXIDE. C. W. DeLong. July 30, 1951. Decl. with deletions Dec. 27, 1955. 14p. Contract W-31-109-eng-52. $3.30(ph OTS); $2.40(mf OTS).

Data are presented on the absorption of tritium oxide vapor through human skin. Under the experimental conditions used, the average rate constant was found to be 0.28 ± 0.08 $\mu c/cm^2$ skin/min per $\mu c/cc$ of atmosphere for the forearm exposures, but some of the data suggested a higher rate constant for other portions of the body surface. The effects of various parameters on percutaneous absorption are discussed, and the relationship of the data to estimation of maximum permissible limits is mentioned briefly. (auth)

CHEMISTRY

7113 AECD-3969
Massachusetts Inst. of Tech., Oak Ridge, Tenn. Engineering Practice School.
THE CATALYTIC RECOMBINATION OF HYDROGEN AND OXYGEN. T. W. Costikyan, C. B. Hanford, and D. L. Johnson. June 2, 1952. Decl. Dec. 23, 1955. 26p. (KT-130). $0.25(OTS).

An investigation was made of the catalytic recombination of H and O in a catalytic bed of platinized alumina pellets. The apparatus and procedure used are described, and reaction-rate data and calculated values are tabulated. (C.H.)

7114 AECD-4040
National Bureau of Standards, Washington, D. C.
QUARTERLY PROGRESS REPORT FOR JULY, AUGUST AND SEPTEMBER 1953. Jan. 1954. Decl. Jan. 10, 1956. 52p. (NBS-D-125). $7.80(ph OTS); $3.30 (mf OTS).

The status of each of the various projects is summarized, reference being made in many cases to technical reports issued during the period. Discussions are presented on the preparation of Be dimethyl, picene, and coronene and the preparation and thermal properties of aryl silanes. A by-product from the synthesis of triphenylene was investigated. Some results of phase studies of U–Ag and U–Au alloys and the systems UC_2–Be_2C and UC–UC_2–BeC_2 are given. (auth)

7115 N-2194
[Boston Univ.]
REPORT ON THE PURIFICATION OF CALCIUM OXIDE, CALCIUM NITRATE, POTASSIUM PERMANGANATE, OXALIC ACID, AND BROMINE. May 15, 1944. and

PROCEDURE FOR THE PREPARATION OF PURE CALCIUM OXIDE. July 7, 1944. and REPORT ON THE WORK OF GLEN J. NIHART AT BOSTON UNIVERSITY. July 27, 1944. Decl. Jan. 27, 1956. 15p. $3.30(ph OTS); $2.40(mf OTS).

Work is reported on the purification of $KMnO_4$ by recrystallization; sublimation of oxalic acid, which sublimes at 130 to 190°C where decomposition starts; purification of Br; preparation of CaO_2; preparation of pure $KMnO_4$; boron-free oxalic acid by sublimation; chlorine-free bromine; nitrate-free NaCl, KCl, and $AlCl_3$; and the development of a method for the analysis of chlorine in bromine. (F.S.)

AEROSOLS

7116 Y-532
Carbide and Carbon Chemicals Corp. Y-12 Plant, Oak Ridge, Tenn.
PROTECTIVE EQUIPMENT EVALUATION PROGRAM QUARTERLY PROGRESS REPORT FOR OCTOBER 1, 1949 TO DECEMBER 31, 1949. Dec. 15, 1949. Decl. Mar. 1, 1956. 35p. $6.30(ph OTS); $3.00(mf OTS).

Progress is reported in an evaluation of gas mask canisters and filter materials for the removal of radioactive aerosols. Test equipment was adapted for use with tracers. A method is presented for the synthesis of methylene blue. A method is also given for the production of S^{35}-labeled sulfur dioxide. A methylene blue aerosol was generated and assessed as to mass concentration and particle size. (C.H.)

7117 Y-605
Oak Ridge National Lab., Y-12 Area, Tenn.
PROTECTIVE EQUIPMENT EVALUATION PROGRAM QUARTERLY PROGRESS REPORT FOR JANUARY 1, 1950 TO MARCH 31, 1950. May 15, 1950. Decl. Mar. 1, 1956. 38p. $6.30(ph OTS); $3.00(mf OTS).

Progress is reported in an evaluation of gas mask canisters and filter materials for the removal of radioactive aerosols. A method is described for the preparation of $S^{35}O_2$. Methods and equipment are described for radiometric and chemical determination of $S^{35}O_2$. A method is described for the preparation of S^{35}-labeled methylene blue. Data are presented on the particle size distribution of methylene blue aerosol following deposition by a thermal precipitator and by a cascade impactor. (C.H.)

7118 Y-638
Oak Ridge National Lab., Y-12 Area, Tenn.
PROTECTIVE EQUIPMENT EVALUATION PROGRAM QUARTERLY PROGRESS REPORT FOR APRIL 1, 1950 TO JUNE 30, 1950. Aug. 9, 1950. Decl. Jan. 30, 1956. 56p. $9.30(ph OTS); $3.60(mf OTS).

Progress is reported in an evaluation of gas mask canisters and filter materials for the removal of radioactive aerosols. Data are included on the preparation of $S^{35}O_2$ from S^{35} using a sulfur burner; the performance of equipment for end window counting of S^{35} as $BaS^{35}O_4$; ion chamber determination of S^{35} as $S^{35}O_2$; the results of M-11 canister tests; the synthesis of S^{35}-labeled methylene blue; ion chamber determinations of S^{35}-labeled methylene blue; efficiency of the precipitator electrometer method to determine the aerosol penetration of filter paper; the efficiency of electrostatic precipitators as aerosol collectors; aerosol penetration determinations with standard stain tests; filter evaluations using dioctyl phthalate; and the effects of x irradiation on filtration of DOP with type 6 filter paper. (C.H.)

7119 Y-687
Oak Ridge National Lab., Y-12 Area, Tenn.
PROTECTIVE EQUIPMENT EVALUATION PROGRAM QUARTERLY PROGRESS REPORT FOR JULY 1, 1950 TO SEPTEMBER 30, 1950. Nov. 20, 1950. Decl. Mar. 1, 1956. 39p. $6.30(ph OTS); $3.00(mf OTS).

Progress is reported in an evaluation of gas mask canisters and filter materials for the removal of radioactive aerosols. A series of tests were made of the collection efficiency of gas mask canisters in which SO_2 and $S^{35}O_2$ were used as test agents. Both chemical and radiometric methods of canister effluent analysis were employed. Data are tabulated. Results are reported from an evaluation of the efficiency of CWS Type 6 filter paper in which the penetration of methylene blue through a test stain was used as the criteria. The efficiency of Type 6 filter material as determined by radioactive measurements of the influent and effluent concentrations was investigated by means of the precipitator-electrometer procedure, and results are reported. Attempts were made to prepare a compound labeled with S^{35} for use as a substitute for dioctyl phthalate. Data are included from a study of the removal of SO_3 by Type 6 filter paper. (C.H.)

7120 Y-724
Oak Ridge National Lab., Y-12 Area, Tenn.
PROTECTIVE EQUIPMENT EVALUATION PROGRAM QUARTERLY PROGRESS REPORT FOR OCTOBER 1, 1950 TO DECEMBER 31, 1950. May 4, 1951. Decl. Jan. 30, 1956. 28p. Contract W-7405-eng-26. $4.80 (ph OTS); $2.70(mf OTS).

Progress is reported in an evaluation of gas mask canisters and filter materials for the removal of radioactive aerosols. A detailed report is made of the calibration of a flow-type ion chamber which was developed for use in a sensitive canister test. Sulfur dioxide labeled with S^{35} was prepared. A thermal precipitator was rebuilt and tested as a particle collector in a system used for making particle size determinations of methylene blue aerosol. The apparatus, technique, and results are discussed. A method is described for the preparation of thio- and phospho- compounds of DOP. (C.H.)

7121 Y-768
Oak Ridge National Lab., Y-12 Area, Tenn.
PROTECTIVE EQUIPMENT EVALUATION PROGRAM QUARTERLY PROGRESS REPORT FOR JANUARY 1, 1951 TO MARCH 31, 1951. June 28, 1951. Decl. Jan. 30, 1956. 25p. $4.80(ph OTS); $2.70(mf OTS).

A determination of the absolute activity of the $S^{35}O_2$ gas used to calibrate the flow-type ionization chamber-electrometer was made in order to determine the ionization chamber efficiency. The process used to determine the absolute activity consisted of absorption of the gas in I solution, addition of inert H_2SO_4 to the solution as a carrier, precipitation of $BaS^{35}O_4$ in a counting cup, and counting of this infinitely thick layer with a Pb-shielded end-window GM tube. The results obtained were applied to the calibration of the flow-type ionization chamber. Results are given of the determination of the particle size distribution of inert methylene blue aerosol. An aerosol generator of the LaMer-Sinclair type is described. Preliminary results using this generator are discussed briefly. (C.H.)

ANALYTICAL PROCEDURES

7122 A-1064
Madison Square Area, Manhattan District, New York.
ANALYTICAL INFORMATION REPORT FOR THE PERIOD NOVEMBER 1–DECEMBER 15, 1944. Jan. 1, 1945. Decl. Dec. 8, 1955. 28p.

This report contains the following papers: Union Carbide and Carbon Research Labs., Niagara Falls, N. Y. A METHOD FOR DETERMINATION OF SMALL AMOUNTS OF URANIUM. W. W. Ingram; and Princeton Univ., N. J. THE DIRECT POLAROGRAPHIC DETERMINATION OF METAL [URANIUM] IN THE PRESENCE OF COPPER AND LEAD. G. P. Haight, Jr.; and Geological Survey. PRELIMINARY REPORT ON METHODS OF ANALYSIS FOR VERY SMALL PERCENTAGES OF URANIUM. M. D. Foster, F. S. Grimaldi, and R. E. Stevens (RMOO-407; TEI-2). $4.80(ph OTS); $2.70(mf OTS).

Methods are presented for determining small amounts of U by colorimetric and polarographic methods. (T.W.S.)

7123 A-2943

National Bureau of Standards, Washington, D. C. DETERMINATION OF BORON IN BERYLLIUM AND ITS COMPOUNDS. Martha S. Richmond. June 1947. Decl. Feb. 20, 1956. 21p. $4.80(ph OTS); $2.70(mf OTS).

Procedures which can be used in the presence of fluoride were applied to the analysis of Be and its compounds. The procedures and equipment are described in detail. (B.J.H.)

7124 AECD-4100

[Monsanto Chemical Co.] Dayton Labs., Ohio. RADIOMETRIC ANALYSIS OF THICK SAMPLES. Sergio deBenedetti. Mar. 1, 1944. Decl. Jan. 12, 1956. 5p. (MLM-M-1246; M3-D320; Final Report No. 2). $1.80(ph OTS); $1.80(mf OTS).

This report concerns measurements of Po content in samples whose thickness is larger than the range of α rays, assuming that Po is homogeneously distributed in the sample. (auth)

7125 AECD-4107

Yale Univ., New Haven. ANALYTICAL METHODS AND RESULTS. Henry C. Thomas and Tom A. Bither. [nd]. Decl. Jan. 30, 1956. 9p. (100XR-991). $1.80(ph OTS); $1.80(mf OTS).

Enrichment of U isotopes by electrolytic methods is evaluated. Detailed descriptions of the techniques employed in sample purification, preparation, and counting are given. Results of the analysis indicate an isotopes enrichment less than 3.0%. (D.E.B.)

7126 AECD-4156

Tennessee Eastman Corp., Oak Ridge, Tenn. COLORIMETRIC DETERMINATION OF MOLYBDENUM IN TF_4 [UF_4]. L. B. Wick, Boyd S. Weaver, and J. W. Gates, Jr. June 4, 1945. Decl. Feb. 14, 1956. 8p. Contract W-7401-eng-23. (CD-4030). Charge $1.80(ph OTS); $1.80(mf OTS).

A method is described for the colorimetric determination of Mo in UF_4. (C.H.)

7127 AECD-4200

Hanford Works, Richland, Wash. A VOLUMETRIC METHOD FOR THE DETERMINATION OF LITHIUM. R. H. Moore. Jan. 9, 1951. Decl. with deletions Dec. 5, 1955. 11p. Contract W-31-109-eng-52. $1.80(ph OTS); $1.80(mf OTS).

A volumetric method for the determination of Li in Al–Li alloys is presented. Lithium is precipitated from alkaline solutions with potassium ferriperiodate and is determined indirectly by an iodometric determination of periodic acid which is formed when the precipitate is dissolved in acid. Aluminum does not interfere. (C.W.H.)

7128 AECD-4202

Tennessee Eastman Corp., Oak Ridge, Tenn. COLORIMETRIC DETERMINATION OF TITANIUM IN THE PRESENCE OF T [U]. PART I. (.1% TO 5%). DeWayne A. Lee, J. A. Widmer, and J. W. Gates, Jr. Sept. 14, 1945. Decl. Feb. 16, 1956. 12p. Contract W-7401-eng-23. (C-1.360.2). $3.30(ph OTS); $2.40(mf OTS).

Titanium is determined quantitatively in the presence of fifteen times as much Fe as Ti in the presence of UO_2 with disodium-1,2-dihydroxy-benzene-3,5-disulfonate using a Beckman spectrometer. This reagent is extremely sensitive for Ti and very few ions give any interference. (F.S.)

7129 AECD-4212

Carbide and Carbon Chemicals Corp. [K-25 Plant], Oak Ridge, Tenn. A METHOD FOR THE DETERMINATION OF BORON IN TF_6 UF_6. E. Staple, E. D. Marshall, F. Nelson, and W. Simon. Mar. 18, 1946. Decl. with deletions Nov. 29, 1955. 14p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

Several methods for the determination of B in UF_6 were studied. The most satisfactory method consisted of evaporation, dissolution in an alcohol–oxalic acid–hydrochloric acid solution, distillation after adding curcumin, and spectrophotometric analysis. Equipment and procedures are described. (D.E.B.)

7130 ANL-4911

Argonne National Lab., Lemont, Ill. A RAPID CHEMICAL METHOD FOR THE DETERMINATION OF LITHIUM IN LITHIUM–ALUMINUM ALLOYS. D. H. Purcell and G. B. O'Conner. Apr. 1, 1952. Decl. Dec. 9, 1955. Contract W-31-109-eng-38. $0.15(OTS).

A volumetric method is presented for the determination of Li in Li Al alloys based on the isolation of the Li by precipitation with potassium ferric periodate and an iodometric titration of the ferric Fe and periodic acid liberated when the precipitate is dissolved in acid. The method is sufficiently rapid, more precise and less subject to interferences than existing methods, and is satisfactory for routine control purposes. (auth)

7131 HW-14604

Hanford Works, Richland, Wash. THE PREPARATION OF ALUMINUM NITRATE FROM HYDRATED ALUMINUM OXIDES. M. K. Harmon. Oct. 5, 1949. Decl. Mar. 26, 1956. 15p. Contract [W-31-109-eng-52]. $3.30(ph OTS); $2.40(mf OTS).

Aluminum nitrate was prepared as an approximately 2.8M solution at 0.6M acid deficiency by refluxing stoichiometric quantities of Alcoa C-33 or C-34 hydrated aluminum oxide for 3 hr with 38% HNO_3, adding a second and equal charge of oxide and refluxing for 2 hrs, and separating the unreacted oxide for recycle. Tables and plots of analytical data and a chemical flowsheet are included. (F.S.)

7132 HW-22090

Hanford Works, Richland, Wash. AN INFRARED ABSORPTION METHOD FOR TBP AFTER EXTRACTION FROM AN AQUEOUS PHASE. R. H. Moore and D. W. Brite. Sept. 20, 1951. Decl. Jan. 4, 1956. 14p. Contract W-31-109-eng-52. $3.30(ph OTS); $2.40(mf OTS).

Aqueous solutions containing tributyl phosphate (TBP), TBP and HNO_3, or TBP, HNO_3, and uranyl nitrate can be analyzed with an estimated precision of ±8.3% of the TBP at the 99% confidence level by extracting with CCl_4 and determining the infrared transmittancy of the organic solution. The method applies to the determination of as little as 0.05 g of TBP/liter and can probably be extended to the determination of 0.02 g of TBP/liter. The method is selective though not specific for TBP. Nonvolatile substances which will extract along with TBP and which absorb at 1031 or 1061 cm^{-1} may be expected to interfere. (C.H.)

7133 MITG-A29
Massachusetts Inst. of Tech., Cambridge. Dept. of Metallurgy.
RADIOMETRIC RESEARCH. James H. Pannell, Emilia M. Rubino, and Elizabeth W. Warren. Aug. 4, 1947. Decl. Apr. 11, 1956. 25p. $4.80(ph OTS); $2.70(mf OTS).

Preliminary test have indicated a possibility of radiometric assay of U in leach solution. The method appears to be useful for strong solutions and may be useful for weaker solutions if measurements are made promptly after evaporation. Application to routine leach plant control appears favorable. (D.E.B.)

7134 NYO-4000
New York Operations Office, AEC.
DETERMINATION OF TRACES OF URANIUM IN BLOOD. George Welford and John Alercie. June 1952. Decl. Jan. 5, 1956. 14p. $0.15(OTS).

A separation of trace quantities of uranium from whole blood by means of an anion exchange resin is described. A ten milliliter portion of blood is treated with sulfuric and nitric acid in order to decompose the organic matter and to form the sulfate complex of any uranium present. Iron and other inorganic materials are kept in solution by the use of Versene, Fe-specific. The uranium sulfate anion complex is exchanged on the sulfate form of IR-4B resin and then eluted with 2.5N nitric acid. The other inorganic constituents of blood are not exchanged on the resin. The resulting solution is analyzed fluorimetrically. The method is useful up to a concentration of at least 100 micrograms of uranium per liter of blood, which covers the range of concentrations normally found in persons with uranium exposure. The average recovery is over 90% of the amount of uranium known to be present. (auth)

7135 NYO-5244
Mallinckrodt Chemical Works, St. Louis.
RAPID PROCEDURE FOR THE DETERMINATION OF CALCIUM. Joseph R. Simmler. Mar. 1951. Decl. Dec. 5, 1955. 9p. Contract [W-14-108-eng-8]. $0.15(OTS).

The procedure given consists essentially of precipitating the Ca as the sulfate from an ethyl-methyl alcohol medium to separate it from any other elements particularly U, Mg, Co, and Ni. (J.E.D.)

7136 ORNL-983
Oak Ridge National Lab., Tenn.
MANUAL OF ANALYTICAL PROCEDURES FOR THE U^{235} RECOVERY PROCESS. M. T. Kelley, P. F. Thomason, L. T. Corbin, S. A. Reynolds, C. L. Burros, and E. J. Frederick—H. P. Raaen, ed. Aug. 20, 1951. Decl. Jan. 5, 1956. 154p. Contract W-7405-eng-26. $0.75(OTS).

Step-by-step procedures are presented for the analytical methods which have been found most suitable for control of the U^{235} recovery process. The ionic analyses included are those for total acid in hexone, free acid in low- and high-activity-level uranyl nitrate solutions, oxidizing power of $Na_2Cr_2O_7$, total reducing normality of aqueous solutions, isobutylmethylcarbinol in hexone, inorganic fluorides, Hg, and U. The high-sensitivity recording polarograph used at ORNL is described. The methods and techniques of radiochemical activity analysis are reviewed, and procedures for radiochemical determination of gross β and γ activity, Ce, Nb, Ru, Zr, and Pu are presented. Physical methods reported are for density of radioactive aqueous solutions by the falling-drop method and specific gravity of make-up solutions. (D.E.B.)

7137 ORNL-1846
Oak Ridge National Lab., Tenn.
COULOMETRIC TITRATION OF CHLORIDE AND OF CHROMIUM IN HOMOGENEOUS REACTOR TYPE SOLUTIONS. W. D. Shults, II and P. F. Thomason. Mar. 25, 1955. Decl. Dec. 5, 1955. 43p. Contract W-7405-eng-26. $0.30(OTS).

The modifications and extension of two existing coulometric titration methods for the determination of chloride and of Cr(IV) in homogeneous-reactor type solutions are reported. (F.S.)

Refer also to abstract 7108.

FLUORINE AND FLUORINE COMPOUNDS

7138 AECD-4065
Carbide and Carbon Chemicals Div. K-25 Plant, Oak Ridge, Tenn.
HEAT OF REACTION OF CHLORINE TRIFLUORIDE WITH WATER. G. D. Oliver and J. W. Grisard. Oct. 24, 1950. Decl. with deletions Jan. 5, 1956. 7p. Contract W-7405-eng-26. $1.80(ph OTS); $1.80(mf OTS).

A measurement of the heat liberated when ClF_3 reacts with water has been made in a simple Dewar calorimeter. The ClF_3 vapor was bubbled into approximately 20 moles of water; the weight of material used, heat equivalent of the calorimeter, and the temperature rise of the water and calorimeter were determined. From these data an average value for the heat of reaction was calculated to be 81.0 ± 0.4 kcal/mole. Analysis of the reaction solution and evolved gas showed the following to be present: HF, HCl, Cl_2, O_2, and probably O_2-Cl_2 compounds. (auth)

7139 HW-24495
[Hanford Works, Richland, Wash.]
REMOVAL OF HYDROGEN FLUORIDE FROM AN AIR STREAM BY ADSORPTION IN A DOREX CHARCOAL FILTER. K. M. Harmon. May 16, 1952. Decl. Feb. 2, 1956. 4p. Contract [W-31-109-Eng-52]. $1.80(ph OTS); $1.80(mf OTS).

A Dorex charcoal filter was evaluated with respect to its use for removal of low concentrations (0.2 mol. %) of HF gas from an air stream. The charcoal absorbed 48g of HF before the efficiency dropped from the 96 to 98% level. Marble chips appear to be more suitable than charcoal. Absorption of 99% was obtained for 4-8 mesh chips. (F.S.)

7140 HW-25771
[Hanford Works, Richland, Wash.]
CAPACITY OF MARBLE CHIPS TO ABSORB HF GAS FROM AN AIR STREAM. K. M. Harmon. Sept. 29, 1952. Decl. Feb. 2, 1956. 4p. Contract [W-31-109-eng-52]. $1.80(ph OTS); $1.80(mf OTS).

The efficiency of 4-8 mesh marble chips in removing HF from an air stream was measured and found to be 99% until the $CaCO_3$ was 50% reacted. Marble chip would be satisfactory for removing HF in the hydrofluorination furnace hood ducts. The capacity of $CaCO_3$ (gm/HF unit volume) is 12.5 times greater than that of charcoal and the HF is chemically reacted and does not corrode the canister and fittings as in charcoal, where the HF is held by surface adsorption. (F.S.)

GRAPHITE

7141 AECD-3861
North American Aviation, Inc., Downey, Calif.
RECENT DEVELOPMENTS IN GRAPHITE TECHNOLOGY. Dec. 4, 1952. Decl. Dec. 5, 1955. 15p. Contract [AT-11-1-gen-8]. (NAA-SR-Memo-485). $0.20(OTS).

A study was made of materials which can be used to join graphite to graphite with a strong impervious bond. This

technique is of interest in joining graphite pipe and may be found useful in the fabrication of graphite heat exchangers for use with liquid metals. The fabrication of intricate parts of graphite and a study of the porosity of the material is reported. (F.S.)

7142 AECD-3914
United Carbon Products Co., Inc., Bay City, Mich.
HEATING TESTS IN GRANULAR RESISTANCE FURNACES FOR PREPARING HIGH PURITY GRAPHITE. G. T. Sermon. Dec. 19, 1947. Decl. Dec. 8, 1955. 15p. Contract AT-30-1-Gen-127. (UCP-6). $3.30(ph OTS); $2.40(mf OTS).

A series of test runs was conducted to determine the heating characteristics of the granular resistance furnaces to be used in preparing pure graphite. Results of the tests are summarized. (B.J.H.)

7143 ANL-4196
Argonne National Lab., Lemont, Ill.
ENERGY OF ACTIVATION OF DISLOCATED CARBON ATOMS AS DETERMINED FROM THE IRREVERSIBLE RESISTANCE CHANGES IN IRRADIATED GRAPHITE. R. L. Seifert. Sept. 13, 1948. Decl. Dec. 13, 1955. 29p. Contract W-31-109-eng-38. $0.25(OTS).

Resistivity measurements have been used to determine the activation energy spectrum for thermal healing of lattice distortions in neutron irradiated graphite. The energy spectrum is given for a sample of graphite having about 20 L-units of irradiation at approximately 125°C. Resistivity measurements are given as a function of temperature for both irradiated and unirradiated samples of graphite. (auth)

7144 ANL-4765
Argonne National Lab., Lemont, Ill.
A COMPARISON OF THE EFFECTS OF OXIDATION AND THE EFFECTS OF NEUTRON IRRADIATION ON GRAPHITE. Gerhart Hennig. Feb. 22, 1952. Decl. Dec. 9, 1955. 20p. Contract W-31-109-Eng-38. $0.20(OTS).

The changes of the electrical properties of oxidized graphite have been compared with the changes produced by neutron irradiation. It has been possible to separate the neutron-induced damage into the damage produced by electron removal and that produced by scattering centers. A model for radiation damage has been proposed. The empirically determined electrical properties differ in many ways from those calculated from the Wallace band theory of graphite. (auth)

7145 HW-14632
Hanford Works, Richland, Wash.
PURIFICATION OF GRAPHITE. M. Garbrecht. Oct. 4, 1949. Decl. Jan. 30, 1956. 6p.

This is a Supplementary Document to HW-12780. $1.80 (ph OTS); $1.80(mf OTS).

Brief descriptions of important experiments and developments on purified graphite are given. (B.J.H.)

7146 HW-25766
[Hanford Works, Richland, Wash.]
HEATING IN THE GRAPHITE DUE TO A CADMIUM CONTROL ROD. W. H. Newkirk. Sept. 29, 1951. Decl. Feb. 2, 1956. 15p. Contract [W-31-109-Eng-52]. $3.30(ph OTS); $2.40(mf OTS).

A multigroup method was used to calculate, for cylindrical geometry, the heat energy source density in graphite due to absorption and Compton scattering of those gammas produced by neutron capture in a H_2O-filled Cd control rod. (B.J.H.)

7147 HW-31578
Hanford Atomic Products Operation, Richland, Wash.
MACHINABILITY OF GRAPHITES FOR FUTURE PILES. E. M. Woodruff. July 21, 1954. Decl. Feb. 20, 1956. 18p. Contract [W-31-109-Eng-52]. $3.30(ph OTS); $2.40(mf OTS).

An index of machinability has been determined for many experimental graphites that are fabricated from various raw materials, and have a wide range of densities, temperatures of graphitization, and particle sizes. The following conclusions are drawn concerning the effect of these variables on graphite machinability. Machinability varies inversely with density. For artificial graphite with a temperature of graphitization of about 2500°C, it is predicted that a density of about 1.8 g/cc represents the maximum density that can be readily machined by the present Hanford machining equipment. An increase in temperature of graphitization causes an improvement in machining properties. It is predicted that graphitization temperatures below 2000°C will produce graphites that are not readily machinable. It is possible that the machinability of graphites of densities greater than 1.8 may be sufficiently increased by a higher maximum graphitization temperature so that they are readily machinable. Graphite machinability varies directly with particle size. The binder material has a definite effect on graphite machinability. While there is a large variation in machinability caused by varying raw materials, no graphite examined with density below 1.8 g/cc and graphitization temperature above 2000°C was found to be unmachinable with Hanford equipment. Extruded experimental samples have machinabilities comparable to extruded production grade graphite. Therefore, it will be possible to assure that a graphite has satisfactory machinability characteristics without producing production size bars. (auth)

7148 HW-32497
[Hanford Atomic Products Operation, Richland, Wash.]
EFFECT OF PROCESS VARIABLES ON GRAPHITE PURITY. W. C. Riley and A. M. Corners. July 20, 1954. Decl. Dec. 1, 1955. 13p. Contract [W-31-109-Eng-52]. $0.20(OTS).

The effects of maximum temperature of graphitization, flow rate of purification gas, and type of stock charged on the purity of graphite were explored. A comparison of the purity of AGOT material and GBF stock was made. (J.A.G.)

7149 NAA-SR-32
North American Aviation, Inc., Los Angeles.
TENSILE STRENGTH OF GRADES ECA AND SL-25 GRAPHITE UP TO THE SUBLIMATION POINT. C. R. Malmstrom and A. F. Gorton. July 11, 1949. Decl. Dec. 6, 1955. 9p. Contract AT-11-1-Gen-8. $0.15(OTS).

The breaking strength of National Carbon Company grades ECA and SA-25 graphite under pure tensile stress was measured from room temperature up to the sublimation point. The strength rises to a maximum which is approximately twice the room temperature value at about 2500°C and then decreases rapidly to zero at about 3400°C surface temperature. (auth)

Refer also to abstract 7370.

LABORATORIES AND EQUIPMENT

7150 A-205
Yale Univ., New Haven. Sterling Chemistry Lab.
APPARATUS FOR BOUNDARY CONTROL IN COUNTER-CURRENT ELECTROLYSIS. Delafield DuBois and Herbert L. Krauss. July 24, 1942. Decl. Jan. 13, 1956. 11p. $3.30(ph OTS); $2.40(mf OTS).

7151 AECD-4204
Tennessee Eastman Corp., Oak Ridge, Tenn.
DEVELOPMENT OF EQUIPMENT FOR THE PURIFICA-

TION OF MERCURY BY DISTILLATION. J. E. Lee, Jr. and C. D. Susano. May 26, 1945. Decl. Feb. 16, 1956. 48p. Contract W-7401-eng-23. (CD-GS-39). $7.80 (ph OTS); $3.30(mf OTS).

An investigation of the Hg salvage program has resulted in the development of an improved high-capacity type of distillation apparatus. The still, electrically heated and essentially automatic in its operation, will produce at a rate greater than 75 pounds per hour and develop a product 99.99% pure or better. This still will handle the lowest grade crude or amalgam that can pass through the feed lines and will continue to develop a pure product for comparatively long periods of time. The clean-out operation is amazingly simple and convenient and may be done within one-half hour while the apparatus itself is still hot. (auth)

SEPARATION PROCEDURES

7152 AECD-3885
Knolls Atomic Power Lab., Schenectady, N. Y.
LABORATORY UNITS FOR DISSOLVING, HEAD-END TREATMENT, AND SOLVENT EXTRACTION. J. R. Gould. Oct. 3, 1952. Decl. with deletions Jan. 6, 1956. 18p. Contract W-31-109-eng-52. $0.20(OTS).

This report describes a laboratory-scale unit equipped to dissolve Hanford slugs, head-end treat, and solvent extract the feeds. These facilities are very useful for the testing and development of a variety of processes with a minimum expenditure of time, manpower, and money. With equipment of this type, complete process information may be obtained on a 300 ml scale at full activity level. (auth)

7153 AECD-4102
Tennessee Eastman Corp., Oak Ridge, Tenn.
THE COPRECIPITATION OF THORIUM AND URANIUM PEROXIDES. Roy Oringer, R. W. Woodard, and C. E. Larson. May 10, 1946. Decl. Feb. 2, 1956. 37p. Contract W-7401-eng-23. (C-0.380.5). $6.30(ph OTS); $3.00 (mf OTS).

7154 AECD-4137
[Battelle Memorial Inst., Columbus, Ohio.]
PROGRESS REPORT FOR THE MONTH OF FEBRUARY 1947. E. J. Center, H. R. Nelson, H. A. Pray, A. C. Richardson, and J. D. Sullivan. Feb. 28, 1947. Decl. Jan. 25, 1956. 25p. Contract W-38-094-eng-27. (BMI-JDS-8). $4.80(ph OTS); $2.70(mf OTS).

Progress in the chemical determination of U by the ether-extraction method has shown good agreement as checked by the cupferron method. Water leaching of superphosphates gave large U extraction. Beta-counting on liquid samples and half life studies have been continued. Work on roasting, smelting, and chlorination of low-grade U ores is summarized. (F.S.)

7155 AECD-4138
Battelle Memorial Inst., Columbus, Ohio.
PROGRESS REPORT FOR THE MONTH OF JANUARY 1947. E. J. Center, H. R. Nelson, H. A. Pray, and A. C. Richardson. Jan. 31, 1947. Decl. Jan. 31, 1956. 25p. Contract W-38-094-eng-27. (BMI-JDS-6). $4.80(ph OTS); $2.70(mf OTS).

Pyrometallurgical work has shown that removing the carbonaceous material from Tennessee shale by roasting does not result in the loss of U. Volatilization tests on the roasted shale indicated that from 12 to 35% of the metal could be removed by this treatment. Smelting tests on ores did not result in an appreciable removal of U. Continued leaching of phosphate rock with H_2SO_4 showed high dissolution of U. Manufacture of superphosphate and triple superphosphate showed even higher extractions, over 85%, but large portions of the superphosphate were damaged by the leaching. Work on the recovery of U from the leach solution shows promise. Eighty-five to 90% of the U may be removed from solutions with 25 mg/l U by precipitation with MgO. This method might be applicable to shales but not to phosphate rock. Another promising method of recovery is by ion exchange. Studies of beta-counting methods have continued with special emphasis on the effect of sample thickness in the holder and sample density. (auth)

7156 AECD-4176
[Tennessee Eastman Corp., Oak Ridge, Tenn.]
SEPARATION OF TUBALLOY FROM METALLIC TANTALUM. E. L. Wagner, L. O. Gilpatrick, and R. F. Raeuchle. Dec. 28, 1944. Decl. Feb. 16, 1956. 6p. (CD-490). $1.80(ph OTS); $1.80(mf OTS).

Quantitative recovery of U from metallic Ta in the form of relatively pure $U_2(NO_3)_2$ leaves less than 1 ppm U in the crude solid Ta_2O_5 recovered. Tantalum is chlorinated to put it into solution. Uranium is precipitated as the tetrafluoride, made quantitative by a second co-precipitation with CaF_2 and the Ta_2O_5 is recovered from the filtrate by NH_3 precipitation. (F.S.)

7157 CC-3625
Argonne National Lab., Lemont, Ill.
FRACTIONATION OF FISSION PRODUCTS AND HEAVY ELEMENTS BY VOLATILIZATION METHODS. N. D. Erway and O. C. Simpson. Aug. 27, 1946. Decl. Feb. 15, 1956. 45p. Contract W-31-109-eng-38. $7.80(ph OTS); $3.30(mf OTS).

A fractionating crucible having a number of collector plates was used to separate long-lived fission product oxides by volatilization methods. Collected activities were analyzed both by absorption measurements and by chemical separation. The degree of separation of Cm^{242} from Am^{241} was determined by pulse analysis of the alpha activities. It was possible to separate Am by this method using a spiral baffle system crucible and collecting the volatilizing activities on a single plate above the crucible orifice under certain optimum conditions. (F.S.)

7158 CN-1745
Chicago. Univ. Metallurgical Lab.
PEROXIDES IN ETHYL ETHER. Problem 204MLC2105. Remsen T. Schenck. June 15, 1944. Decl. Feb. 15, 1956. 5p. (A-2456). $1.80(ph OTS); $1.80(mf OTS).

7159 HW-29010
Hanford Atomic Products Operation, Richland, Wash.
BACKMIXING IN PULSE COLUMNS II, EXPERIMENTAL VALUES AND EFFECT OF SEVERAL VARIABLES. W. H. Swift and L. L. Burger. Aug. 11, 1953. Decl. Feb. 1, 1956. 6p. Contract [W-31-109-eng-52]. $1.80(ph OTS); $1.80(mf OTS).

Seven runs were made with the system Penn. Ref. Co. "Supersol" (dispersed), water (continuous) to investigate the effects of pulse frequency, amplitude, plate spacing, volume flow ratio, and throughput on backmixing, using the technique of continuous injection of a tracer solution into the packed section. Backmixing was found to be surprisingly insensitive to all the above variables over the range studied with the exception of pulse amplitude and continuous phase flow rate, showing greatest dependence on the latter. Backmixing increased with decreasing continuous phase flow rate and increased with pulse amplitude. (auth)

7160 ISC-268
Ames Lab., Ames, Iowa.
AN ECONOMIC EVALUATION OF THE SILICA GEL ADSORPTION PROCESS FOR THE SEPARATION OF HAFNIUM FROM ZIRCONIUM. W. R. Millard and

R. H. Maitland. Aug. 1952. Decl. Jan. 7, 1956. 11p. Contract W-7405-eng-82. $0.15(OTS).

The silica gel process produces Hf-free Zr at $7.10/lb which is not competitive with the thiocyanate process. This cost could perhaps be reduced by recovery and recycling the methanol, finding the exact pilot-plant labor cost, and the pilot-plant equipment, which is not scaled down to 1000 lbs per month, could be used to better advantage. (F.S.)

7161 M-256

Du Pont de Nemours (E. I.) & Co. Jackson Lab., Wilmington, Del.

THE SEPARATION OF URANIUM AND VANADIUM IN YCA NATURITA SLUDGE WITH NITRIC ACID. R. C. Downing. Aug. 23, 1943. Decl. Feb. 14, 1956. Contract W-7412-eng-3. (JWD-4). $1.80(ph OTS); $1.80(mf OTS).

Under the conditions studied employing HNO_3, separation of U and V did not occur. In all cases the two metals were found in both the filtrate and insoluble precipitate. A further complication was observed in that the sludges contained appreciable amounts of chlorides which would introduce corrosion difficulties unless removed. A 100% excess of HNO_3 at 80 to 90°C gave the best separation. (auth)

7162 MCW-8

Mallinckrodt Chemical Works, St. Louis.

AN INVESTIGATION OF METHODS FOR THE SEPARATION OF URANIUM CONTAINED IN URANIUM BEARING ORE CONCENTRATES FROM WESTERN COLORADO. G. C. Reid. Apr. 1, 1946. Decl. Dec. 1, 1955. 17p. Contract W-7405-eng-1. $0.20(OTS).

Two methods were tried for the production of U(IV) oxide. The first, a NaOH leach, was designed to convert the V to soluble Na vanadate, and the U to insoluble Na uranate, after which the separation could be made by filtration. The second method included a roasting step in which a mixture of carnotite, C, and Na_2CO_3 was heated to 800°C during which time the U would be reduced to U_3O_8 and the V converted to soluble sodium vanadate. The separation could then be made by leaching the ignited cake with water. The first method was unsuccessful. The second method worked very well, giving a clean separation and high recovery of U. (auth)

7163 MITG-235

Massachusetts Inst. of Tech., Watertown. Mineral Engineering Lab.

REMOVAL OF URANIUM FROM PHOSPHORIC ACID WITH MONAZITE. John Dasher, Galen W. Clevenger and Norman N. Schiff. July 1, 1950. Decl. Feb. 10, 1956. 25p. Contract AT-30-1-GEN-211. $0.25(OTS).

The mineral monazite removes U from dilute phosphoric acid. The removal is proportional to the surface of the mineral and the loading on finely-ground monazite is equivalent to that on ion exchange resins. Seventy-five to 80% of the U is removed in 1 step, and if the acid is reduced and retreated with monazite, 92 to 97% of the U is removed. The adsorbed U is leached from the monazite by an oxidizing acid or by a sodium carbonate solution and the monazite can be reused repeatedly with a small loss. Fine monazite is unfilterable and coarse monazite is required in prohibitive amounts. Filter aid improves the filtration of fine monazite, especially when impractically thin cakes are formed. The reaction is interesting, but not understood. It seems unlikely that a process using monazite can be developed to compete with ion exchange resins for recovery of by-product U. (auth)

7164 MITG-238

Massachusetts Inst. of Tech., Cambridge. Mineral Engineering Lab.

THE RECOVERY OF URANIUM AND VANADIUM FROM LOW URANIUM AMMONIA PROCESS PRECIPITATES. Galen W. Clevenger. July 1, 1950. Decl. Jan. 11, 1956. 36p. Contract AT-30-1-Gen-211. $6.30(ph OTS); $3.00(mf OTS).

Tests have been run to determine optimum conditions for roasting and Na_2CO_3 leaching of low-grade precipitates made by ammoniating wet process phosphoric acid to monoammonium phosphate. Some studies have been made concerning precipitation of U and V from the leach solutions. Pilot-plant specifications for recovery of 40% U_3O_8 and 80% V_2O_5 products are given. Estimated costs based on complete process tests are given. (auth)

7165 MITG-263

Massachusetts Inst. of Tech., Watertown. Mineral Engineering Lab.

PRELIMINARY MINERAL ENGINEERING STUDIES OF CUPRIFEROUS URANIUM ORES R-1 AND R-2. D. R. George, Charles S. Abrams, Paul Galvanek, Jr., and F. W. Bloecher, Jr. Jan. 17, 1951. Decl. Jan. 11, 1956. 25p. Contract AT-30-1-Gen-211. $0.25(OTS).

Eighty-five to 95% of the U and Cu in raw ore and 90 to 95% of the U and Cu in roasted ore were extracted by leaching with H_2SO_4 solutions. Lyometallurgical procedures extracted comparable amounts of U from these ores but extracted little of the Cu. Ion exchange or selective precipitation of the U from the leach solutions yields precipitates containing 30 to 95% U_3O_8. The Cu is readily recovered from the acid leach solutions by cementation or by electrolysis. CuS in the ores or leach residues is readily recovered by froth flotation. (auth)

7166 NYO-1315

Mallinckrodt Chemical Works, St. Louis.

THE ROASTING OF PITCHBLENDE ORE. O. J. Buckheim, H. C. Kloepper, R. M. Paine, A. E. Ruehle, J. W. Stevenson, and L. G. Weber. Dec. 12, 1950. Decl. Dec. 3, 1955. 13p. Contract [W-14-109-eng-8]. $0.20 (OTS).

A study of the possibility of removing sulfur from pitchblende by roasting led to the following conclusions. Increasing the temperature of the air roast increases both the sulfur removal and the filtration rate, but also increases the uranium loss in the leached digest cake. The length of time of roast has a much smaller effect than the temperature on sulfur removal and filtration rate. A steam roast removes as much sulfur as an air roast; it does not increase the filtration rate; it increases the uranium losses in the leached digest residue to a lesser extent. Increased air flow and thinner beds lead to increased sulfur removal. Acid leaching of the digest cake will reduce the uranium loss to about half the loss by a carbonate leaching. The uranium losses after either the acid leach or the carbonate leach of the digest cake from the roasted ores are too high to be tolerated. (auth)

7167 NYOO-1009

Louisville, Ky. Univ. Inst. of Industrial Research.

DISTILLATION SEPARATION OF ZIRCONIUM AND HAFNIUM. Summary Report for February 14, 1949 to March 31, 1950. Gordon C. Williams, S. V. Galginaitis, E. G. Baker, Jr., A. H. Isaacs, E. W. Holzknecht, R. A. Gillespie, R. G. Moody, and L. A. Graham. Aug. 1, 1950. Decl. Dec. 8, 1955. 169p. Contract AT(30-1)-534. $1.10 (OTS).

A summary report on distillation techniques applied to the separation of Hf, and Zr phosphorus oxychloride complexes is presented. Included are results of glassware and pilot plant operations using batch and continuous procedures. Experiments in the determination of the vapor pressure of technical $ZrCl_4$, investigations of chemical methods of converting $POCl_3$ and PCl_5 complexes of $ZrCl_4$ to ZrO_2, corro-

sion studies, and economic considerations also are reported. (auth)

7168 ORNL-912
Oak Ridge National Lab., Tenn.
STUDY OF HALF-INCH PULSE COLUMN WITH A TBP SYSTEM. C. V. Ellison. May 21, 1951. Decl. Jan. 27, 1956. 32p. Contract W-7405-eng-26. $0.25(OTS).

A glass pulse column 0.5-in. diam. by 36 in. high was studied with U solutions and tributyl phosphate–hydrocarbon mixed solvent. Variables were: plate spacing, plated design, pulse amplitude, solvent/aqueous flow ratio, and nitric acid concentration. (auth)

7169 UCRL-718
California. Univ., Berkeley. Radiation Lab.
PERFORMANCE OF LIQUID-LIQUID EXTRACTION EQUIPMENT. Barney Rubin and Hugh R. Lehman. May 24, 1950. Decl. Nov. 4, 1955. 76p. Contract W-7405-eng-48. $12.30(ph OTS); $4.50(mf OTS).

This report supersedes AECD-3030.

A pulse column one-half inch in diameter has been built and operated utilizing the systems water, uranyl nitrate, cyclohexanone, and water, uranyl nitrate, pentaether. The reported efficiency of such columns has been verified in that minimum values of heights per equivalent theoretical stage (HETS) have been obtained in the range of seven to ten inches. The column has been found simple to operate and stable in operation. It appears to offer decided advantages for applications where columns of high extraction efficiency are desired. A general correlation has been developed for predicting the performance of countercurrent liquid extraction towers, in which values of over-all heights per transfer unit (HTU) are expressed in terms of simple linear functions of the flow rates of both phases. The validity of the correlation is demonstrated by applying it to a large number of published extraction data. HTU values determined experimentally for the pulse column have been found to obey the above correlation with reasonable accuracy. Values of the individual film HTU's may be predicted approximately for pentaether under the conditions of a pulse amplitude of 0.25 gallons per pulse per half-cycle and two inch plate spacing from the equations: $(HTU)_G$ = 3.8G inches and $(HTU)_L$ = 5.0 inches at 25 pulses per minute, and $(HTU)_G$ = 3.6G inches and $(HTU)_L$ = 4.0 inches at 45 pulses per minute. It is suggested that the above correlation offers a method for interpreting column behavior in terms of pulse frequency and amplitude, plate spacing, number of perforations per plate, perforation diameter, and properties of the separate phases, as fundamental variables. (auth)

Refer also to abstract 7209.

TRANSURANIC ELEMENTS AND COMPOUNDS

7170 ANL-4573
Argonne National Lab., Lemont, Ill.
SPECTROPHOTOMETRIC STUDIES OF PLUTONIUM(IV) AND (VI) NITRATES IN METHYL ISOBUTYL KETONE. Michael G. Berkman and Louis Kaplan. Jan. 1951. Decl. Jan. 5, 1956. 21p. Contract W-31-109-eng-38. $0.25(OTS).

Changes in the spectra of plutonium(IV) solutions in methyl isobutyl ketone (Hexone) upon the addition of tetrabutylammonium nitrate are caused by the formation of the stable hexanitrate complex $Pu(NO_3)_6^{=}$. The similarity of the spectrum of this complex to that of plutonium(IV) in 11M aqueous nitric acid confirms the existence of the hexanitrate in the latter solution. Nitric acid is much less effective than is tetrabutylammonium nitrate with respect to complexing plutonium(IV) in methyl isobutyl ketone. In the absence of added nitrate, the tetranitrato complex appears to be stable. Plutonium(VI) nitrate, like uranyl nitrate, is converted to a trinitrate complex by tetrabutylammonium nitrate in methyl isobutyl ketone. The plutonium complex is about twice as stable as the uranium complex. The dinitrate complex is probably the predominant species in this solvent in the absence of added nitrate, and also in 14.6M aqueous nitric acid. Solutions of plutonium(VI) nitrate in methyl isobutyl ketone are gradually reduced to plutonium(IV). The rate of reduction is decreased by the addition of nitrate. (auth)

7171 HW-28711
Hanford Atomic Products Operation, Richland, Wash.
RADIOCHEMICAL STUDIES ON THE ISOTOPE PLUTONIUM-241. A. Chetham-Strode, Jr. July 14, 1953. Decl. Jan. 9, 1956. 45p. Contract W-31-109-eng-52. $0.30(OTS).

A method for the determination of small amounts of Am in Pu was developed. The half-life of Pu-241 was measured by following the growth of its Am daughter into a Pu sample of known isotopic content and found to be 14.2 ± 1 years. The production of Pu^{241} in the piles was studied as a function of neutron exposure and isotope content by similar techniques and the results correlated with other pertinent data. (auth)

7172 KAPL-M-PF6-1
Knolls Atomic Power Lab., Schenectady, N. Y.
PURIFICATION OF PLUTONIUM HEXAFLUORIDE. J. W. Codding, N. J. Hawkins, and W. W. Sabol. July 8, 1955. Decl. Feb. 7, 1956. 12p. Contract W-31-109-Eng-52. $3.30(ph OTS); $2.40(mf OTS).

The three-part distillation described represents a quick and convenient method for removing the commonly occurring gaseous impurities from PuF_6. In actual practice, the first distillation (from liquid nitrogen) can take place directly after the preparation, while the PuF_6 is still condensed in the coils of the reactor, since liquid nitrogen is used as the coil coolant. The distillation method as described provides for the rapid and essentially complete removal of HF, with a PuF_6 loss as low as desired. (auth)

7173 LA-1139
Los Alamos Scientific Lab., N. Mex.
REMOVAL OF IRON FROM PLUTONIUM SOLUTION BY BASIC ACETATE PRECIPITATION. L. J. Mullins. June 1, 1950. Decl. Dec. 7, 1955. 14p. Contract W-7405-eng-36. $0.15(OTS).

The separation of Pu from Fe by means of a "basic acetate" precipitation was studied. The Pu was oxidized to PuO_2^{2+} with $KMnO_4$ and the Fe precipitated by the addition of $NH_4C_2H_3O_2$. The following results were obtained: 96 to 98% of the Pu may be separated from Fe by the acetate method if acetate is >1.9M and the Pu is oxidized to Pu^{6+}. The carrying of PuO_2^{2+} by the Fe precipitate is primarily a function of acetate concentration. No difference in the carrying of PuO_2^{2+} by the Fe precipitate was noted when Fe was present initially in the concentration range 0.005M to 0.1M. UO_2^{2+} acts effectively as a holdback carrier for Pu when Pu is present in tracer quantities. The effect is negligible for macro concentrations of Pu. (auth)

TRITIUM AND TRITIUM COMPOUNDS

Refer to abstract 7112.

URANIUM AND URANIUM COMPOUNDS

7174 A-2316
Brown Univ., Providence.
RECOVERY OF R [URANIUM] FROM SOLUTIONS CON-

TAINING FLUORIDE ION BY EXTRACTION WITH DIBUTYL "CARBITOL." INVESTIGATION OF $Al(NO_3)_3$ AS SALTING OUT AGENT. Charles A. Kraus. July 27, 1945. Decl. Jan. 17, 1956. 18p. Contract W-7405-eng-73. (BT-55). $3.30(ph OTS); $2.40(mf OTS).

In the presence of fluoride ion, $Al(NO_3)_3$ has proved satisfactory as salting out agent for use in the recovery of U by extraction with the triether, dibutyl "Carbitol." The Al^{3+} effectively ties up F^-, allowing the U to be extracted without a measurable amount of F^- going over into the organic phase. The addition of $Ca(NO_3)_2$ to a solution containing $Al(NO_3)_3$ greatly increases the U coefficient. Beside determining U coefficients, investigations were carried out which demonstrate that the extraction method may be employed effectively for recovering traces of U from solutions (~1 ppm.) containing F^-. (auth)

7175 A-2715

Purdue Univ., Lafayette, Ind.

PURDUE PILOT PLANT STUDIES ON THE RECOVERY OF URANIUM FROM SYNTHETIC β-GUNK. R. E. Hatton, E. T. McBee, R. N. Shreve, T. S. Taylor, A. A. Alberts, D. W. Pearce, R. Mezey, G. M. Rothrock, P. E. Weimer, and Z. D. Welch. [194?]. Decl. Jan. 17, 1956. 87p. $15.30(ph OTS); $5.40(mf OTS).

Results are reported from pilot plant studies on the recovery of U from wastes and the preparation of UCl_4 by known processes and by processes developed through research. A process was developed for the liquid-phase chlorination of calcined U peroxide with carbon tetrachloride. Variations of this process in both equipment and mode of operation were investigated. The removal of U from effluents by evaporation, ThO_2 treatment of effluents, and ammonia treatments of effluent were also studies. (C.H.)

7176 A-2911

Madison Square Area, Manhattan District, New York.

ANALYTICAL INFORMATION REPORT. Nov. 16, 1945. Decl. Jan. 17, 1956. 15p.

This report contains the following papers: Princeton [Univ.], N. J. THE EFFECT OF ZINC NITRATE ON THE DISTRIBUTION COEFFICIENT IN ETHER EXTRACTION; and THE DISTRIBUTION COEFFICIENT OF URANIUM USING COMBINATIONS OF SALTING AGENTS. George H. Morrison; and BORON DISTILLATION STUDIES. John A. Nyitrai. $3.30(ph OTS); $2.40(mf OTS).

Data are presented from studies on the distribution coefficient in ether extraction of uranyl nitrate from solutions of zinc nitrate; the distribution coefficient of U using combinations of salting agents; and the distillation of boron. (C.H.)

7177 AECD-3784

Purdue Univ., Lafayette, Ind.

THE RECOVERY OF URANIUM BY THE HIGH TEMPERATURE CHLORINATION OF THE AMMONIA PRECIPITATE OBTAINED FROM OXIDIZED ALPHA GUNK. J. Newcomer. Mar. 15, 1946. Decl. with deletions Dec. 2, 1955. 22p. Contract W-7405-eng-74. $4.80(ph OTS); $2.70(mf OTS).

A method was developed for the recovery of U from the NH_3 precipitate obtained from oxidized α gunk. It is based upon treatment of the NH_3 precipitate with Cl_2 at 640 to 680°C. The impurities are volatilized from the hot zone as ferric chloride, chromyl chloride, nickel chloride, and molybdenyl chlorides, while U_3O_8 remains as a black residue. (auth)

7178 AECD-3827

Chicago. Univ. Metallurgical Lab.

CHEMICAL RESEARCH—GENERAL CHEMISTRY. REPORT FOR PERIOD OF FEBRUARY 1 TO MARCH 10, 1944. F. H. Spedding and H. A. Wilhelm. Apr. 14, 1944. Decl. with deletions Dec. 13, 1955. 22p. $4.80(ph OTS); $2.70(mf OTS).

7179 AECD-3878

Bell Telephone Labs., Murray Hill, N. J.

A POSSIBLE NEW VOLATILE COMPOUND OF URANIUM. [PARTS I AND II]. J. J. Lander. (Pt. I, July 8, 1943; Pt. II, July 31, 1943). Decl. Jan. 6, 1956. 23p. (ID-XR-34). $4.80(ph OTS); $2.70(mf OTS).

The possibility of the formation of $U(CO)_6$ is discussed and its probable properties suggested from the properties of other group VI_a carbonyls. Methods of preparation are also considered. (D.E.B.)

7180 AECD-4101

Massachusetts Inst. of Tech., Watertown, Mass.
Mineral Engineering Lab.

ELECTROLYTIC REDUCTION OF URANYL AND FERRIC SULFATE SOLUTIONS. Wilfred Freyberger. May 12, 1950. Decl. Dec. 15, 1955. 14p. Contract W-7405-eng-85. (MITG-A95). $0.20(OTS).

The current efficiency of reduction of UO_2^{2+} decreases with increasing pH between the values of pH 0.1 and 2.6. Ferric-ion reduction shows no appreciable change in this same range. The current efficiency for reduction of Fe^{3+} and UO_2^{2+} varies almost inversely with increasing current density in the range of 0.5 to 9 amp/ft^2. Increasing the concentration of UO_2^{2+} by a factor of 50 increases the current efficiency 60 fold. Increasing the Fe^{3+} concentration by a factor of 50 increases the current efficiency 10 fold. Mechanical agitation is helpful; the current efficiency doubles with mechanical agitation of 150 rpm. and more than doubles at 500 rpm. Ferric ion at an initial concentration of 2 g/l is reduced at a rate directly proportional to the concentration; uranyl ion at 0.1 g/l is reduced more slowly. The reduction of Fe^{3+} is enhanced by the presence of UO_2^{2+}. (auth)

7181 AECD-4103

Tennessee Eastman Corp., Oak Ridge, Tenn.

FACTORS AFFECTING THE PRECIPITATION OF URANIUM PEROXIDE. D. W. Mogg and C. E. Larson. July 8, 1946. Decl. Feb. 2, 1956. 42p. Contract W-7401-eng-23. (C-0.375.5). $7.80(ph OTS); $3.30(mf OTS).

This is a compilation of the data on uranium peroxide precipitations appearing in several reports. The solubility product is measured. The effect of many individual ions on the hydrogen peroxide decomposition rate and the complexing of uranium is demonstrated. (auth)

7182 AECD-4105

Massachusetts Inst. of Tech., Watertown, Mass.
Mineral Engineering Lab.

ELECTROLYTIC PRECIPITATION OF URANIUM FROM RAND LEACH SOLUTIONS. Galen W. Clevenger. Feb. 28, 1951. Decl. Dec. 20, 1955. 21p. Contracts W-7405-Eng-85, AT-1-30-Gen-211, and AT(49-1)-533. (MITG-A106). $0.20(OTS).

Various electrolytic tests were made using leach liquors derived from Blyvooruitzicht residues and synthetic solutions similar to the leach liquors. Using pure solutions a high grade uranium precipitate was obtained with less than 1 kwh of electric power/lb U_3O_8. Electrolysis of leach liquors produced low-grade precipitates and consumed excessive amounts of power due to side reactions with impurities. (auth)

7183 AECD-4106

Massachusetts Inst. of Tech., Watertown.
Mineral Engineering Lab.

ALPHA COUNTING FOR THE ASSAY OF URANIUM IN ION EXCHANGE EFFLUENTS. Emilia M. Rubino. Feb. 28, 1951. Decl. Dec. 20, 1955. 22p. Contracts W-7405-Eng-

85 and AT-30-1-Gen-211. (MITG-A113). $0.20(OTS).

A method for producing uniform thin films was developed which permitted the determination of U in Rand ion exchange effluents by α counting. Correlation of the α activity with U content was obtained. (C.W.H.)

7184 AECD-4111

Tennessee Eastman Corp., Oak Ridge, Tenn.

HIGH TEMPERATURE CHLORINATION OF SALVAGE RESIDUES RECOVERY OF [URANIUM] FROM TRAP WASHES. R. W. Veatch, Jr. and A. J. Miller. Mar. 14, 1946. Decl. Jan. 30, 1956. 8p. Contract W-7401-eng-23. (C-2.320.4). $1.80(ph OTS); $1.80(mf OTS).

A method of recovering the U from the trap washes of the high-temperature salvage chlorinator was developed. By means of the method a solution was obtained which contained 97 to 99% of the U from the trap washes contaminated with only a small amount of Fe. This solution can easily be processed further to obtain pure solid U compounds. (auth)

7185 AECD-4126

Battelle Memorial Inst., Columbus, Ohio.

PROGRESS REPORT FOR THE MONTH OF OCTOBER 1946. E. J. Center, H. R. Nelson, H. A. Pray, and A. C. Richardson. Oct. 31, 1946. Decl. Jan. 26, 1956. 22p. Contract W-38-094-eng-27. (BMI-JDS-2). $4.80 (ph OTS); $2.70 (mf OTS).

Ores were subjected to gravity concentration, flotation, roasting, smelting, and chlorination processes. Under the test conditions and within the accuracy of the analyses available, no significant concentration was accomplished. The ores were extracted with a variety of chemical reagents but quantitative analyses were not yet available. Electrolytic recovery of U from H_3PO_4 by H_2SO_4 was attempted. X-ray-diffraction studies were made on phosphate rock for phase identification to determine if U is associated with the quartz or the apatite. Theoretical studies of apatite structure are in progress to determine the effect of U added to synthetically prepared apatite. (F.S.)

7186 AECD-4128

Battelle Memorial Inst., Columbus, Ohio.

DISSOLUTION AND RECOVERY OF URANIUM FROM PHOSPHATE ROCK AND SHALE BY CHEMICAL METHODS. John D. Sullivan. Apr. 7, 1947. Decl. Feb. 7, 1956. 11p. Contract W-38-094-eng-27. (BMI-JDS-1(Pt.1)). $3.30(ph OTS); $2.40(mf OTS).

In an attempt to tie U recovery to the fertilizer industry two promising leads, amine precipitation and ether extraction, were followed. Uranium can be recovered from Chattanooga shale by precipitation with magnesium hydroxide. (F.S.)

7187 AECD-4139

Battelle Memorial Inst., Columbus, Ohio.

DISTRIBUTION OF URANIUM IN PHOSPHATE ROCK AND SHALE. Iver Igelsrud, John D. Sullivan, and Adam Wesner. Jan. 15, 1947. Decl. Jan. 25, 1956. 18p. Contract W-38-094-eng-27. (BMI-JDS-5). $3.30(ph OTS); $2.40(mf OTS).

The distribution of U in Tennessee shale, Idaho phosphate rock, and washed Florida pebble phosphate was determined. The average uranium content of the rocks was ~0.01%. (C.W.H.)

7188 AECD-4140

[Battelle Memorial Inst., Columbus, Ohio.]

PROGRESS REPORT FOR THE MONTH OF SEPTEMBER 1947. A. E. Bearse, E. J. Center, I. Igelsrud, A. C. Richardson, and J. D. Sullivan. Sept. 30, 1947. Decl. Feb. 23, 1956. 18p. Contract W-38-094-eng-27. (BMI-JDS-15). $3.30(ph OTS); $2.40(mf OTS).

Progress is reported on ore dressing and pyrometallurgical studies, leaching of superphosphates, precipitation of U with amines, recovery of P_2O_5, roasted and retorted shales, and U analysis by ether extraction. (F.S.)

7189 AECD-4152

Tennessee Eastman Corp., Oak Ridge, Tenn.

A DISCUSSION OF THE DISTRIBUTION OF TUBANYL [URANYL] SALTS BETWEEN ORGANIC SOLVENTS AND AQUEOUS SOLUTIONS. R. L. Tichenor and John R. Van Wazer. Jan. 30, 1945. Decl. Feb. 14, 1956. 7p. Contract W-7401-eng-23. (CD-GS-19). $1.80(ph OTS); $1.80(mf OTS).

Fundamental concepts of theoretical chemistry were applied in studies of the distribution of uranyl salts between organic solvents and aqueous solutions. Variations in U distribution coefficient based on analyses for total U in each phase were studied. A discussion is included on the influence of the nature and concentration of solutions on the distribution coefficient. (C.H.)

7190 AECD-4155

[Tennessee Eastman Corp., Oak Ridge, Tenn.]

THE DETERMINATION OF TOTAL NON-U CATIONS IN UF_4 BY PENTA-ETHER EXTRACTION. H. Yellin and E. E. Sinclair. Mar. 22, 1946. Decl. Feb. 15, 1956. 7p. (C-4.381.5). $1.80(ph OTS); $1.80(mf OTS).

Results are presented from a study of optimum conditions for the separation of U from non-U cations using pentaether. Results of analysis of UF_4 samples using a total non-uranium cation method are compared with results using another method. (C.H.)

7191 AECD-4184

Tennessee Eastman Corp., Oak Ridge, Tenn.

RECOVERY OF TUBALLOY FROM STANDARDIZED SALVAGE RESIDUES FROM BETA. V. P. Calkins and C. E. Larson. Decl. Feb. 13, 1956. 9p. Contract W-7401-eng-23. (C-0.320.5). $1.80(ph OTS); $1.80(mf OTS).

Two methods of U recovery from a salvage residue containing 0.30% U were demonstrated. High-temperature fluorination with direct and quantitative U extraction with carbitol depends on Si removal by successful prehydrofluorination. Direct treatment with $NaAlCl_4$ will yield good results only if there is a pretreatment with HF. (F.S.)

7192 AECD-4188

Tennessee Eastman Corp., Oak Ridge, Tenn.

CONVERSION OF URANIUM HEXAFLUORIDE TO URANIUM TRIOXIDE. K. B. Brown and C. E. Larson. Sept. 5, 1946. Decl. Feb. 15, 1956. 29p. Contract W-7401-eng-23. (C-0.375.6). $4.80(ph OTS); $2.70(mf OTS).

Uranium trioxide is formed by dissolving UF_6 in water, precipitating as a nearly fluoride-free compound and igniting. Uranium recovery greater than 99.9% is attained. (F.S.)

7193 AECD-4206

Tennessee Eastman Corp., Oak Ridge, Tenn.

QUALITATIVE OBSERVATIONS OF THE CHARACTERISTICS OF TCl_5 [UCl_5] DECOMPOSITION. Gilbert Gavlin, J. V. Hubbard, and G. H. Clewett. Apr. 3, 1945. Decl. Feb. 15, 1956. 6p. Contract W-7401-eng-23. (CD-PPO-14). $1.80(ph OTS); $1.80(mf OTS).

The controlled decomposition of the UCl_5 was carried out in an electric furnace at furnace temperatures varying from 144 to 550°C. The results indicate that Cl_2 evolution is noticeable when the UCl_5 temperature is about 75°C. The rate of reaction increases rapidly at a UCl_5 temperature of 175°C. Thus the possibility of UCl_5 existing at a very high temperature becomes uncertain. The UCl_4 prepared at the low temperatures (up to 300°) was obtained as micro crystalline powder while those products allowed to heat to 400 to 500°C had a characteristic crystalline appearance. (auth)

7194 BMI-928
Battelle Memorial Inst., Columbus, Ohio.
THE SOLUBILITY OF URANIUM IN FUSED HYDROXIDES. J. W. Droege, M. J. Snyder, and R. B. Filbert, Jr. July 20, 1954. Decl. Dec. 10, 1955. 28p. Contract W-7405-eng-92. $0.25(OTS).

Solubilities of uranium in molten hydroxides of sodium and lithium were measured by filtering mixtures containing an excess of uranium. The molten mixtures were held in a nickel container and were filtered through graphite filters. Controlled atmospheres of argon and hydrogen were used. Maximum solubilities were found in mixtures containing equal parts by weight of sodium and lithium hydroxides. The solubilities were greatly increased by the addition of NaH and, at 1000 F, reached a maximum of 0.13 w/o in a mixture containing 6 per cent of NaH. The increased solubility was probably due to the dehydrating action of NaH, since a similar effect was noted for Na_2O addition. Other additives were not found to affect the solubility materially. The uranium solubility was lower when a hydrogen atmosphere was used than when the mixtures were in an argon atmosphere. (auth)

7195 BMI-945
Battelle Memorial Inst., Columbus, Ohio.
PREPARATION OF IRRADIATION SPECIMENS OF THE URANIUM–CHROMIUM EUTECTIC ALLOY. H. A. Saller, R. F. Dickerson, and W. E. Murr. Aug. 16, 1954. Decl. Nov. 30, 1955. 18p. Contract W-7405-eng-92. $0.20 (OTS).

Casting methods and fabrication techniques used for the production of enriched U–Cr eutectic alloy specimens are outlined. (C.W.H.)

7196 CT-2712
Iowa State Coll., Ames.
THE PRODUCTION OF URANIUM BY THE REDUCTION OF UF_4 BY Mg. F. H. Spedding, H. A. Wilhelm, and W. H. Keller. June 26, 1945. Decl. Jan. 4, 1956. 67p. Contract W-7405-eng-82. $0.40(OTS).

The reactants were mixed in a mechanical mixer, placed in steel reactors or bombs lined with high-Ca or fused dolomitic lime and preheated in a gas-heated furnace at 1150 to 1250°C for about 50 min, until reaction occurred. The products, U and MgF_2, were fused by the combined heat of reaction and the heat added by the furnace and collected as liquids in the bottom of the reactor. They were separated by gravity into a pool of metal covered by a pool of slag. The metal solidified into a cylindrical ingot, and averaged 99% in content. (auth)

7197 HW-14708
Hanford Works, Richland, Wash.
THE FLOCCULATION OF URANIUM COMPOUNDS WITH CALCIUM NITRATE. W. G. Hudson. Oct. 12, 1949. Decl. Feb. 20, 1956. 7p. Contract [W-31-109-eng-52]. $1.80(ph OTS); $1.80(mf OTS).

In a study of calcium nitrate, ferric sulfate, and potassium aluminum sulfate as flocculants for U recovery in place of $CaCl_2$, only the $Ca(NO_3)_2{-}4H_2O$ was satisfactory and produced rapid and complete flocculation. More complete precipitations were obtained by $Ca(NO_3)_2$ being added in 2 equal portions and rapid agitation in the upper half of the solution allowed the sludge to settle out and remain undisturbed. (F.S.)

7198 K-567
Carbide and Carbon Chemicals Corp. K-25 Plant, Oak Ridge, Tenn.
THE REACTOR OF URANIUM TETRAFLUORIDE WITH DRY OXYGEN. S. S. Kirslis, T. S. McMillan, and H. A. Bernhardt. Mar. 15, 1950. Decl. Dec. 27, 1955. 36p. Contract [W-7405-eng-26]. $0.30(OTS).

The reaction of dry oxygen with dry UF_4 has been studied over a range of elevated temperatures under various conditions of oxygen flow. The reaction had been reported to proceed at 800°C according to the equation: $2\ UF_4 + O_2 \rightarrow UO_2F_2 + UF_6$. It was found that a minimum temperature of 740°C was required to produce detectable amounts of UF_6. Using a steady O flow passing over fused lumps of UF_4 at 830°C at a linear velocity of approximately 80 cm/min., the exposed portions of the lumps reacted rapidly to form UO_2F_2 and UF_6, but the centers of the lumps remained unreacted after several hours of oxidation. In addition, approximately 20% of the U was found distributed on cooler downstream portions of the reactor wall in the form of UO_2F_2, UF_4 and intermediate uranium fluorides. The yield of UF_6 was roughly 60% of the quantity predicted by the equation written above. When the oxidation reaction was carried out with alternating O pressure and vacuum, less UF_6 was formed and a white solid, $UO_{\frac{1}{2}}F_4$, was blown out of the reactor. Under these conditions, ten grams of UF_4 lumps were converted completely to products in 30 to 45 minutes at 830°C. Chemical analysis, x-ray diffraction patterns and thermal decomposition studies showed that the white solid oxidation product was a uranium oxyfluoride not previously observed, with the formula $UO_{\frac{1}{2}}F_4$. This compound was probably an intermediate in the oxidation of UF_4 to give UO_2F_2 and UF_6. (auth)

7199 M-854
Du Pont de Nemours (E. I.) & Co. Jackson Lab., Wilmington, Del.
RECOVERY OF URANIUM VALUES FROM BY-PRODUCT SCRAP MATERIALS. Louis Spiegler. Jan. 25, 1944. Decl. Jan. 10, 1956. 65p. Contract W-7412-eng-151. (JWD-13). $10.80(ph OTS); $3.90(mf OTS).

A study of methods for recovery of uranium values from scrap or by-product materials produced in the manufacture of uranium metal was made. Processes and data for the design and operation of a suitable plant were developed. The method developed consists of conversion of metal values with sulfuric acid to water-soluble uranyl sulfate followed by precipitation and isolation of insoluble peruranic acid. (F.S.)

7200 M-2104
Purdue Univ., Lafayette, Ind.
THE PREPARATION AND REACTIONS OF CERTAIN COMPOUNDS OF TUBALLOY [URANIUM]. Monthly Technical Report [for] April 1, 1945 to May 1, 1945. E. T. McBee, D. W. Pearce, and Z. D. Welch. Decl. Jan. 27, 1956. 19p. Contract W-7405-eng-74. $3.30(ph OTS); $2.40(mf OTS).

The rate of the reaction between UO_3 and hexachloropropene can be readily controlled by adding the UO_3 to refluxing hexachloropropene. Ammonium chloride is not satisfactory for use in the chlorination of the ammonia precipitate at temperatures up to 600°C. A series of experiments was conducted to show the effect of Cl and O, Cl and steam, and Cl alone upon the removal of Fe and Cr from the ammonia precipitate at 700°C. Chlorination with Cl and O or stream are equally effective in converting Fe and Cr compounds to volatile chlorides. Chlorine is less effective. Neither Ni or Hastelloy B is satisfactory for use in the construction of equipment for the chlorination of the ammonia precipitate. The effects of pressure and of temperature upon removal of U from ignited C ash by extraction with 70% nitric acid was studied. Approximately 90% of the U was removed from the ignited C ash by digestion with nitric acid for 4 hours at about 105°C. and about 55 lb. per sq. in., while about 95% of the U was removed by digestion for 4 hours at about 170°C. and about 130 lb. per sq. in. Nitric acid having a concentration of 70% was shown to be more effective for U removal from ignited C ash than nitric acid having a concentration of 15% (94% and

63%, respectively). A series of experiments was conducted to show the effect of time upon U removal from C ash by extraction at 120°C. with 70% nitric acid. About 80% was removed by extraction for 1 hour and about 95% was removed by extraction for 4 hours. Approximately 99% of the U in ignited C ash can be solubilized by a single fusion with potassium pyrosulfate. The ash can be rendered soluble by a single fusion with a mixture containing 10 parts potassium pyrosulfate and 3 parts potassium bifluoride. Calcium carbonate was found to be more satisfactory for use as a flux in burning ground graphite parts than either sodium carbonate, alone or with sodium silicate, or sodium hydroxide. (auth)

7201 M-2113

Purdue Univ., Lafayette, Ind.

THE PREPARATION AND REACTIONS OF CERTAIN COMPOUNDS OF TUBALLOY [URANIUM[. Monthly Technical Report [for] January 1, 1946 to February 1, 1946. E. T. McBee, D. W. Pearce, and Z. D. Welch. Decl. Jan. 30, 1956. 17p. Contract W-7405-eng-74. $3.30(ph OTS); $2.40(mf OTS).

The recovery of U from synthetic 3-gunk and its conversion to uranium oxides were studied. The data from a ten-cycle experiment show that 99.18% of the U charged was recovered at the end of the tenth cycle. The average recovery of U per cycle was 99.92%. Experiments were carried out in which U was recovered from synthetic 3-gunk and converted to uranium tetrachloride. The average recovery of U was 99.8%. Uranium tetrachloride of excellent quality was prepared from a solution of uranyl nitrate by evaporation, calcination and subsequent reaction of the calcined product with hexachloropropene in a stainless steel vessel. Recovery of U was 100.0 ± 0.1%. The density of uranium tetrachloride was found to be a function of the temperature during the degassing step. A maximum density of 2.02 was obtained at a temperature of 450°C. Attempts were made to prepare pure hexachloropropene by rectification of commercial hexachloropropene and by synthesis using a modified UO_3 Prins procedure. Pure hexachloropropene reacts with UO_3 very slowly with no violent reaction. Two devices have been constructed to be used for the evaluation of uranium tetrachloride. One of these was designed for the determination of variations in temperature necessary to produce a uniform rate of evaporation of a given sample of uranium tetrachloride. The other was designed for the determination of the fraction of a given sample of uranium tetrachloride which will volatilize at a given temperature. Satisfactory test runs with both devices have been carried out. A sample of uranium tetrachloride from Experiment P-63 showed that 43% remained unvolatilized after being kept at 500°C for 6 hours. (auth)

7202 MITG-216

Massachusetts Inst. of Tech., Watertown, Mass. Mineral Engineering Lab.

EFFECT OF IMPURITIES ON THE PRECIPITATION OF URANIUM FROM PHOSPHORIC ACID SOLUTIONS WITH AMMONIA. PART I. Galen W. Clevenger. Mar. 24, 1950. Decl. Jan. 25, 1956. 23p. Contract AT-30-1-Gen-211. $4.80(ph OTS); $2.70(mf OTS).

The effects of various impurities (F, Si, Al, V, Ca, SO_4^{2-}, and $Na_4P_2O_7$) on the precipitation of U from reduced H_3PO_4 solutions by neutralization with NH_3 were studied. Of the substances tested, Ca, V, and mixtures of Al and F, Ca and F, and Ca and H_2SO_4 did not interfere with the U precipitation. (C.W.H.)

7203 MITG-223

Massachusetts Inst. of Tech., Watertown. Mineral Engineering Lab.

ENRICHING NH_3 PRECIPITATE FROM REDUCED PHOSPHORIC ACID. (Experiments on Dissolving and Reprecipitation) Robert J. Woody. July 1, 1950. Decl. Jan. 11, 1956. 27p. Contract AT-30-1-gen-211. $4.80(ph OTS); $2.70(mf OTS).

At least 80% of the impurities in the low-grade (0.1 to 0.2% U_3O_8) precipitates produced by the neutralization of Anaconda 27°Bé H_3PO_4 with ammonia can be rejected by a dilution process with attendant loss of less than 5% of the U treated. Less than one ton of water per ton of original acid is required and no reagents other than those used for NH_3 precipitation. An oxidizing leach of NH_3 precipitates with 27°Bé H_3PO_4 followed by V precipitation will reject about half the total impurities present in the primary precipitate and leave 90 to 95% of the U in a partly neutralized phosphate solution enriched about 10-fold in U_3O_8. (auth)

7204 MITG-242

Massachusetts Inst. of Tech., Watertown, Mass. Mineral Engineering Lab.

EXTRACTION OF URANIUM FROM FLORIDA LEACH ZONE, SAMPLE E39. D'Arcy R. George. June 27, 1950. Decl. Jan. 11, 1956. 21p. Contract AT-30-1-Gen-211. $3.30(ph OTS); $2.40(mf OTS).

Eighty to ninety percent of the U was extracted from Florida leached zone ore by hot leaching with concentrated H_2SO_4. The U was recovered from the pregnant solution with an ion exchange resin, Amberlite IRA-400. (auth)

7205 MITG-A73

Massachusetts Inst. of Tech., Watertown, Mass. Mineral Engineering Lab.

CARBONATE EXTRACTION OF URANIUM FROM DISSOLVED LOW-GRADE HYDROXIDE PRECIPITATES. Robert L. Barnard and John J. Brunner. Apr. 3, 1950. Decl. Apr. 11, 1956. 19p. Contract W-7405-eng-85. $3.30(ph OTS); $2.40(mf OTS).

The process discussed in MITG-A53 for upgrading Rand precipitates by dissolving them in acid and pouring the resulting solution into carbonate solution may be modified to reduce acid consumption, but the process still appears unattractive. (auth)

7206 MITG-A74

Massachusetts Inst. of Tech., Watertown, Mass. Mineral Engineering Lab.

FURTHER STUDIES ON THE DOUBLE-PRECIPITATION PROCESS. John J. Brunner. Aug. 5, 1949. Decl. Apr. 11, 1956. 15p. Contract W-7405-eng-85. $3.30(ph OTS); $2.40(mf OTS).

A process is described to produce a low-iron, low-grade U precipitate by first oxidizing Fe with approximately 0.4 mol sulfuric acid and stoichiometric MnO_2 followed by removal of the Fe from dilute pregnant solutions as a ferric iron precipitate. The low-Fe U precipitate is then obtained by further neutralization. The process requires standard hydrometallurgical equipment. (auth)

7207 MITG-A77

Massachusetts Inst. of Tech., Watertown, Mass. Mineral Engineering Lab.

THE RETREATMENT OF LOW-GRADE HYDROXIDE PRECIPITATES BY THE PHOSPHATE PROCESS. Sara E. Bailey. Mar. 3, 1950. Decl. Apr. 11, 1956. 32p. Contract W-7405-eng-85. $6.30(ph OTS); $3.00(mf OTS).

A low-grade hydroxide precipitate has been upgraded to a final concentrate assaying 60 to 90% U_3O_8 and nil to 5% P_2O_5 by a process in which the U was precipitated from a solution of the dissolved hydroxide precipitate with phosphate. However, only 70 to 90% of the U was recovered from the low-grade cake; the U not recovered was lost largely in the insoluble leach cake containing iron oxide, silica, and gypsum. The method involves the use

of five reagents (sulfuric acid, dolomite or magnesia, sodium hydroxide, diammonium phosphate or tetrasodium pyrophosphate, and metallic iron) in economically practical quantities. (auth)

7208 NYO-5067
Mallinckrodt Chemical Works, St. Louis.
REVISED GREEN SALT (UF_4) MILLING, MIXING AND PACKING OPERATION. James C. Graham, Jr. Dec. 6, 1944. Decl. Jan. 5, 1956. 5p. Contract W-7405-eng-29. $1.80(ph OTS).

A revision and rearrangement of the UF_4 milling, mixing, and packing operation are described. This would facilitate dust control, cut material losses, and reduce costs. (J.E.D.)

7209 ORNL-1418
Oak Ridge National Lab., Tenn.
ELUTION OF URANIUM SORBED ON ANION EXCHANGE RESINS FROM LOW-GRADE ORE LEACH LIQUORS. J. T. Roberts and I. R. Higgins. Dec. 20, 1952. Decl. Feb. 28, 1956. 11p. Contract W-7405-eng-26. $1.80 (ph OTS); $1.80(mf OTS).

Results indicated that U which has been sorbed by anion exchange resins from synthetic sulfate and carbonate ore leach liquors can be obtained in a relatively concentrated form and free of excess salts by treating the resin with HCl and eluting with H_2O. (auth)

7210 ORNL-1797
Oak Ridge National Lab., Tenn.
THE pH OF $UO_3-H_2SO_4-H_2O$ MIXTURES AT 25°C AND ITS APPLICATION TO THE DETERMINATION OF THE SOLUBILITY OF UO_3 IN SULFURIC ACID AT ELEVATED TEMPERATURE. W. L. Marshall. Nov. 1, 1954. Decl. Dec. 1, 1955. 20p. Contract W-7405-eng-26. $0.25(OTS).

The pH at 25.00° ± 0.04°C of $UO_3-H_2SO_4-H_2O$ mixtures has been determined to a precision of ±0.004 pH units from 0.024 to 10^{-4} molal H_2SO_4 and at UO_3/H_2SO_4 mole ratios from 0.70 to 1.20. The solubility of UO_3 in H_2SO_4 at elevated temperature (150 to 300°C) has been determined by isolating a UO_3 saturated sample, and comparing the pH of the isolated sample at 25° with the pH data mentioned above. By this method seven isotherms in the concentration range from 1.0 molal down to 10^{-4} molal have been obtained. (auth)

7211 RL-4.6.6
[California. Univ., Berkeley. Radiation Lab.]
A STUDY OF THE OXIDATION OF TCl_4 BY DRY AIR. Special Report—Chemistry Group. John Booher and Abel De Haan, Jr. Nov. 21, 1942. Decl. Sept. 15, 1955. 20p. Contract W-7405-eng-48. (CHEM. S-6). $3.30(ph OTS); $2.40(mf OTS).

Oxidation of UCl_4 by dry air is plotted as a function of temperature. Up to 225°C, O_2 in dry air is inert to UCl_4. At 235°C, the rate is appreciable and is about 10^2 greater at 306°C. (D.E.B.)

7212 RL-4.6.227
[California. Univ., Berkeley. Radiation Lab.]
PRECIPITATION REACTIONS OF ORGANIC ACIDS WITH ELECTROLYTIC CELL EFFLUENT. M. D. Kamen and M. B. Allen. Nov. 17, 1943. Decl. Sept. 15, 1955. 9p. Contract W-7405-eng-48. (CHEM. S-227). $1.80(ph OTS); $1.80(mf OTS).

A study was made of applications of organic acids for the separation of U from various solutions. Results are presented from a preliminary survey of the qualitative precipitation reactions encountered with a variety of organic acids homologous with oxalic acid and other closely related types. It was concluded that oxalic acid was the most feasible precipitating agent for the β process recycle so far as the various organic acids are concerned. (C.H.)

7213 RL-4.6.233
[California. Univ., Berkeley. Radiation Lab.]
PREPARATION OF TUBALLOY [URANIUM] HEXACHLORIDE. II. H. G. Reiber. Dec. 15, 1943. Decl. Sept. 15, 1955. 7p. Contract W-7405-eng-48. (CHEM. S-233). $1.80(ph OTS); $1.80(mf OTS).

Factors affecting the formation of UCl_6 were investigated. Data are presented from studies on the effects of temperature, rates of flow of Cl_2, amount of CCl_4 introduced, and the admission of other gases on the formation and purity of the product. (C.H.)

7214 RL-4.6.257
[California. Univ., Berkeley. Radiation Lab.]
SUBLIMATION OF TCl_4 [UCl_4]. SUMMARY OF EXPERIMENTAL STUDIES ON VARIABLES WHICH ENTER INTO SUBLIMATION. Manfred Mueller. May 5, 1944. Decl. Sept. 15, 1955. 40p. Contract W-7405-eng-48. (CHEM. S-257). $7.80(ph OTS).

Data are summarized from a series of studies which were carried out to determine the relationship between the variables which enter into sublimation, and to obtain numerical data which would make it possible to predict the performance of UCl_4 charges under various conditions. Data are included on the effect of water vapor, thickness of layer of charge material, particle size, and surface impurities on the rate of sublimation. Apparatus used and conditions existing in the experiments are described. (C.H.)

7215 RL-4.6.267
California. Univ., Berkeley. Radiation Lab.
RATE OF SUBLIMATION. HISTORY OF TCl_4 [UCl_4] CHARGES OF VARYING GEOMETRY. Manfred Mueller and Iva Streeter. June 6, 1944. Decl Sept. 15, 1955. 22p. Contract [W-7405-eng-48]. (CHEM. S-267). $4.80(ph OTS).

Results are reported from a geometric study of factors which enhance, circumvent, or eliminate the sublimation of UCl_4. (C.H.)

7216 RL-4.6.276
[California. Univ., Berkeley. Radiation Lab.]
REDUCTION EQUILIBRIA OF TCl_4 and TBr_4. David Altman. Aug. 14, 1944. Decl. Sept. 15, 1955. 16p. Contract [W-7405-eng-48]. $3.30(ph OTS).

The reduction equilibria for UCl_4 and UBr_4 were studied by measuring the pressures of hydrogen halide and hydrogen in equilibrium with the tri- and tetra-halide. The thermal decomposition was calculated. (F.S.)

7217 RL-4.6.925
[California. Univ., Berkeley. Radiation Lab.]
THERMAL ANALYSIS OF THE CHLORIDE–BROMIDE MIXED HALIDE COMPOUNDS OF TETRAVALENT TUBALLOY [URANIUM]. N. W. Gregory. Aug. 2, 1945. Decl. Sept. 15, 1955. 15p. Contract W-7405-eng-48. $3.30 (ph OTS); $2.40(mf OTS).

Results are summarized from a study on the melting points of the mixed halides UCl_3Br_3, UCl_2Br_2, and $UClBr_3$. A comparison is made with the melting points of UCl_4 and UBr_4. (C.H.)

7218 RL-4.6.929
[California. Univ., Berkeley. Radiation Lab.]
HEATS OF FORMATION OF TUBALLOY [U] COMPOUNDS. V. REVISION OF VALUES. C. H. Barkelew. Aug. 28, 1945. Decl. Sept. 15, 1955. 10p. Contract W-7405-eng-48. $3.30(ph OTS); $2.40(mf OTS).

A fundamental error in the method of calculation of the values of heats of formation was found, corrected, and the new heats of formation are recorded. (F.S.)

7219 RL-4.6.936
[California. Univ., Berkeley. Radiation Lab.]
THE HYDROGEN REDUCTION EQUILIBRIA OF THE

CHLORIDE–BROMIDE MIXED HALIDES OF TETRAVALENT TUBALLOY [URANIUM]. N. W. Gregory. Oct. 9, 1945. Decl. Sept. 15, 1955. 26p. Contract W-7405-eng-48. $4.80(ph OTS); $2.70(mf OTS).

Results are reported from H reduction equilibrium studies on UCl_2Br_2 and UCl_3Br. (C.H.)

7220 RL-4.6.937

[California. Univ., Berkeley. Radiation Lab.]
HEATS OF FORMATION OF TUBALLOY [URANIUM] COMPOUNDS. VI. $TOCl_2$, $TOBr_2$, TCl_2Br, $TClBr_2$. C. H. Barkelew. Oct. 11, 1945. Decl. Sept. 15, 1955. 5p. Contract W-7405-eng-48. $1.80(ph OTS); $1.80(mf OTS).

The heats of formation at 0°C from solid U and gaseous halogens at 18°C were determined from heats of solution, using an ice calorimeter. Data are included for $UOCl_2$, $UOBr_2$, UCl_2Br, and $UClBr_2$. (C.H.)

7221 RL-4.6.938

[California. Univ., Berkeley. Radiation Lab.]
EQUILIBRIUM STUDIES ON OXY–CHLORIDE COMPOUNDS OF TUBALLOY [URANIUM]. N. W. Gregory. Oct. 13, 1945. Decl. Sept. 15, 1955. 9p. Contract W-7405-eng-48. $1.80(ph OTS); $1.80(mf OTS).

Results are presented from studies on the hydrogen reduction equilibrium of UOCl and the equilibrium of the reaction between O and UCl_4. (C.H.)

7222 RL-4.6.939

[California. Univ., Berkeley. Radiation Lab.]
THE EFFECT OF RADIANT ENERGY ON SMALL SCALE AGGREGATES OF GRANULAR TCl_4. [UCl_4]. THE RATE OF SUBLIMATION AND TEMPERATURE RESPONSE OF THE AGGREGATES. M. E. Mueller. Oct. 22, 1945. Decl. Sept. 15, 1955. 17p. Contract W-7405-eng-48. $3.30 (ph OTS); $2.40(mf OTS).

Data are presented from studies on the correlation between temperature change caused by input of radiant energy and rate change during sublimation of UCl_4 aggregates. (C.H.)

7223 RMO-2015

International Minerals and Chemical Corp., Chicago.
URANIUM PRODUCTION PROCESS DESIGNS FOR LEACHED ZONE PLANTS. VOLUME IV. URANIUM RECOVERY SECTION. D. F. Clements, R. F. McCullough, and W. C. Knopf. June 30, 1953. Decl. Oct. 27, 1955. 40p. Contract AT(49-1)-545. (IMCC-2035). $7.80(ph OTS); $3.30(mf OTS).

A process for liquid-liquid extraction of U from a phosphate solution and precipitation of UF_4 from the extract is reported. Basic design and economic information for plants to produce 450, 225 and 100 tons of U per year were developed. (F.S.)

7224 RMO-2022

International Minerals and Chemical Corp., Chicago.
URANIUM PRODUCTION PROCESS DESIGNS FOR LEACHED ZONE PLANTS. VOLUME XI. NITRIC ACID DIGESTION PROCESS. D. F. Clements, W. B. Williams, R. F. McCullough, and E. E. Wrege. Sept. 1953. Decl. Oct. 27, 1955. 84p. Contract AT(49-1)-545. (IMCC-2042). $16.80(ph OTS); $5.70(mf OTS).

Progress is reported on studies on the recovery of uranium and phosphate values from the leached portion of the Florida phosphate producing area. Basic design and economic information for a process which produces ammonium diuranate and a nitrogen-phosphate fertilizer from leached zone are presented. In the process, nitric acid is used to solubilize uranium and phosphate from calcined + 14 and –200 mesh fractions of leached zone. Tributyl phosphate extracts U from the leach liquor, a water wash strips U from the organic phase, and ammonia precipitates U from the aqueous phase as ammonium diuranate. Stripped leach liquor is ammoniated to produce a solid nitrogen-phosphate fertilizer which is dried for shipment. Design data for plants which produce 335 and 100 tons of U per year have been developed. (auth)

7225 RMO-2024

International Minerals and Chemical Corp., Chicago.
URANIUM PRODUCTION PROCESS DESIGNS FOR LEACHED ZONE PLANTS. VOLUME XII. DRY MINING, SULFURIC ACID DIGESTION, URANIUM AND P_2O_5 RECOVERY PROCESS. D. F. Clements, W. B. Williams, R. F. McCullough, and E. E. Wrege. Sept. 8, 1953. Decl. Oct. 27, 1955. 47p. Contract AT(49-1)-545. (IMCC-2076). $9.30(ph OTS); $3.60(mf OTS).

The design and economic evaluation or processes for the recovery of U and the manufacture of fertilizer from plants producing UF_4, UF_4 and ammoniated phosphates, and UF_4 and mixed ammoniated phosphate and ammonium nitrate are given. Flow diagrams are included. (F.S.)

7226 RMO-2025

International Minerals and Chemical Corp., Chicago.
URANIUM PRODUCTION PROCESS DESIGNS FOR LEACHED ZONE PLANTS. VOLUME XIII. WET MINING, SULFURIC ACID DIGESTION, URANIUM RECOVERY PROCESSES. D. F. Clements, W. B. Williams, R. F. McCullough, and E. E. Wrege. Sept. 1953. Decl. Oct. 27, 1955. 56p. Contract AT(49-1)-545. (IMCC-2077). $10.80(ph OTS); $3.90(mf OTS).

Progress is reported in studies on the recovery of uranium, alumina and phosphate values from the leached zone portion of the Florida phosphate producing area. Two processes which recover only the U values are considered in this report. Sulfuric acid is used to solubilize U from leached zone in both processes. In Case I, U is recovered from the leached zone extract by a liquid-liquid extraction method. In Case II, U is recovered by ion-exchange. Basic design and economic information for the processes are presented. (auth)

7227 RMO-2040

International Minerals and Chemical Corp., Chicago.
EVALUATION OF ONE-PRODUCT PLANTS. J. B. Adams and Roger Bart. Feb. 1955. Decl. Oct. 27, 1955. 22p. Contract AT(49-1)-545. (IMCC-2211). $3.30(ph OTS); $2.40(mf OTS).

Two processes are presented for U recovery from leached zone from the Florida phosphate area. Production costs per lb U were developed on bases of high maintenance-short amortization, low maintenance-long amortization, and low maintenance-no fixed costs by the dry ore dress-calcining-sulfurous acid digestion and the dry ore dressing-roasting at 250°C with sulfuric acid processes. (F.S.)

7228 TID-5063

Sylvania Electric Products Inc. Metallurgical Labs., Bayside, N. Y.
FACTORS INFLUENCING THE REACTIVITY OF URANIUM TRIOXIDE. R. B. Holden. Oct. 9, 1951. Decl. Jan. 12, 1956. 3p. (DCF-578). $0.10(OTS).

A relationship is established between the rate of denitration of uranium nitrate liquor to UO_3 and the reactivity of the trioxide in the reactivity of the trioxide in the subsequent hydrogen reduction. It was found that the UO_3 which was produced by slow denitration exhibited distinctly better reduction characteristics than the material produced by rapid denitration. (auth)

7229 UCRL-649

California. Univ., Berkeley. Radiation Lab.
THE SYSTEM PENTAETHER–URANYL NITRATE–

NITRIC ACID–WATER. C. N. Stover, Jr. and H. W. Crandall. Apr. 6, 1950. Decl. Nov. 4, 1955. 34p. Contract W-7405-eng-48. $6.30(ph OTS); $3.00 (mf OTS).

The system pentaether–uranyl nitrate–nitric acid–water has been studied in the liquid-liquid region. Aqueous solutions containing 0.0 to 8.2M HNO_3 and 0.0 to 2.3M $UO_2(NO_3)_2$ were equilibrated with pentaether, and the effects of HNO_3 concentration, $UO_2(NO_3)_2$ concentration and temperature are discussed. Phase diagrams for the system are presented and approximate ΔH values are given. Conclusions have been made concerning the mechanism of extraction of $UO_2(NO_3)_2$ by pentaether and the feasibility of the use of this solvent for U recovery. (auth)

7230 WAPD-RM-22

[Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.]

CONTRIBUTION TO THE ELECTROPLATING OF URANIUM OXIDE ON ALUMINUM AND MAGNESIUM. Alois Langer and Carl Wilson. Sept. 25, 1950. 8p. $1.80 (ph OTS); $1.80(mf OTS).

To obtain a satisfactory coating of U_3O_8 on Al or Mg by electrodeposition, a metallic subcoating, preferably Zn, must be applied. In the case of Al, this can be done by a dip in an alkaline Zn solution. Mg must be subcoated electrolytically. End results are satisfactory. (F.S.)

7231 Y-30

Carbide and Carbon Chemicals Corp. Y-12 Plant, Oak Ridge, Tenn.

EXCHANGE OF URANIUM BETWEEN U^{+4} AND UO_2^{+2} IN DILUTE ACID SOLUTION. R. W. Woodard, D. A. Lee, J. S. Drury, and G. H. Clewett. Oct. 7, 1947. Decl. Feb. 21, 1956. 8p. $1.80(ph OTS); $1.80(mf OTS).

In studies on the U atom exchange between the tetravalent and hexavalent ionic states, the effect of temperature, light, and pH were studied. No definite conclusions have been drawn as to the exact mechanism of the exchange. (F.S.)

7232 Y-257

Carbide and Carbon Chemicals Corp. Y-12 Plant, Oak Ridge, Tenn.

THE SEPARATION OF URANIUM ISOTOPES BY CHEMICAL EXCHANGE. Progress Report for the Month of September 1948. R. W. Woodard. Oct. 5, 1948. Decl. Jan. 16, 1956. 6p. Contract W-7405-eng-26. $1.80(ph OTS); $1.80(mf OTS).

7233 Y-351

Carbide and Carbon Chemicals Corp. Y-12 Plant, Oak Ridge, Tenn.

DRUM DRYER AND CALCINING FURNACE FOR THE PREPARATION OF UO_3 FROM URANYL NITRATE SOLUTIONS. G. H. Smith, John F. Lakner, and John S. Reece. Feb. 22, 1949. Decl. Feb. 17, 1956. 25p. Contract W-7405-eng-26. $4.80(ph OTS); $2.70(mf OTS).

Feed preparation and dryer speeds and temperature were investigated for ascertaining the most efficient operating conditions. Design of the drum-type dryer is given. A drum 22 in. in diameter, 27 in. long, constructed of 1/4-in. stainless steel plate, revolving at 1 rpm, and using a 50% $UO_2(NO_3)_2$ solution is recommended. (D.E.B.)

Refer also to abstract 7283.

WASTE DISPOSAL

7234 CF-55-11-143

Oak Ridge National Lab., Tenn.

STUDY OF HRT-CP WASTE EVAPORATOR, ENTRAINMENT SEPARATOR, CONDENSER AND RELATED PIPING. W. L. Carter, P. S. Lindsey, and G. W. Gray. Nov. 25, 1955. 7p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

A design check was made to determine the feasibility of making design modifications in the HRT-CP waste evaporator, entrainment separator, condenser, and related piping. (C.H.)

7235 GEL-67

General Electric Co. General Engineering Lab., Schenectady, N. Y.

UTILIZATION OF THE GROSS FISSION PRODUCTS. Progress Report No. 2 for the Period January 3, 1952 to January 14, 1953. E. L. Mincher and R. M. Lichtenstein. Mar. 20, 1953. Decl. Dec. 2, 1955. 46p. Contract W-31-109-Eng-52. (R53GL91) $0.30(OTS).

Two methods of evaporating mixed-fission-product waste process solutions to dryness are discussed. Direct evaporation under reduced pressure with some added heat was found superior to the freeze-drying method. A β source of ~50 mc was prepared by the former method and activity calculations are presented. (K.S.)

7236 M-4497

Kellex Corp., New York.

[STUDIES ON THE DECONTAMINATION OF WASTE SOLUTIONS BY ION EXCHANGE METHODS.] W. A. Bain. June 3, 1949. Decl. Dec. 5, 1955. 20p. $3.30(ph OTS); $2.40 (mf OTS).

The status of ion exchange research work done in connection with the decontamination of basin water alkaline waste solutions is summarized. (B.J.H.)

ENGINEERING

HEAT TRANSFER AND FLUID FLOW

7237 AECD-4227

[Knolls Atomic Power Lab., Schenectady, N. Y.]

NATURAL CONVECTION FLOW INSIDE SMALL TUBES. R. G. Kennison. Jan. 16, 1953. Decl. Feb. 7, 1956. 11p. Contract W-31-109-eng-52. (MEMO-RGK-13). $3.30(ph OTS); $2.40(mf OTS).

An analysis is made of the heat transferred by natural convection flow inside a small vertical tube with internal heat generation. The reduction in temperature is found to be small. (auth)

7238 KLX-1391

Vitro Corp. of America, New York.

MAGNETIC INDUCTION FLOWMETER DEVELOPMENT. Final Project Status Report. Job 24–B4. July 31, 1953. Decl. Dec. 6, 1955. 71p. Contract AT(30-1)-850. $0.45 (OTS).

Field tests and laboratory studies of prototype magnetic induction flowmeters have resulted in the final design of a model suitable for production. Electronic circuitry has been completely revised, a stainless steel flow tube developed, and a more efficient magnet designed. These and other improvements have made possible improved performance and more compact packaging. Full-scale flow ranges from 200 cc per minute to 20 gallons per minute can now be accommodated; lower full-scale ranges are possible with special design. A production model amplifier-recorder unit has been constructed and tested with a prototype detector unit. A production model detector unit was constructed, but testing was not completed. (auth)

7239 M-4321

Kellex Corp., New York.

FLOW THROUGH VALVES AND ORIFICES. M. Benedict. June 19, 1943. Decl. Nov. 29, 1953. 6p. $1.80 (ph OTS); $1.80(mf OTS)

Formulas for the flow of process gas through valves and orifices are listed and examined. (B.J.H.)

7240 MonP-344
Clinton Labs., Oak Ridge, Tenn.
PHOSPHORUS AS A SUBSTITUTE FOR MERCURY IN A POWER CYCLE. John J. Grebe. July 1, 1947. Decl. Dec. 8, 1955. 23p. Contract W-35-058-eng-71. $4.80 (ph OTS); $2.70(mf OTS).

Properties of P and its possible use above steam in a binary power cycle are discussed. Such a system might be used for plants operating on ordinary fuel such as coal; and the possibility of vaporizing the P in a pile is also considered. (auth)

7241 ORNL-1124
Oak Ridge National Lab., Tenn.
ANALYSIS OF FLOW THROUGH A SPHERE. First Report. D. H. Fax, S. C. Traugott, and G. F. Wislicenus. Feb. 6, 1952. Decl. Jan. 5, 1956. 46p. Contract W-7405-eng-26. $0.35(OTS).

Theoretical work on the predicted fluid flow patterns in a sphere, under the combined influences of friction and distributed heat sources is outlined. (D.E.B.)

7242 SC-3459(TR)
Sandia Corp., Albuquerque, N. Mex.
DAMAGE TO METAL PLATES FROM HIGH-INTENSITY SHORT-DURATION HEAT PULSES. Rex C. Mack. Aug. 25, 1954. 27p. $4.80(ph OTS); $2.70(mf OTS).

Formulas have been derived whereby it is possible not only to determine whether a flat metal plate is being heated uniformly or nonuniformly but the extent of any resultant damage to the plate. Under uniform heating the only immediate material damage that can result is melting of the entire mass of the plate. Nonuniform heating may damage the plate as a result of vaporization or thermal stress. When nonuniform heating is a direct result of unsteady heat input, the maximum tensile stresses occur inside the plate and stress-strain measurements at the surface are probably misleading. A formula for optimum rate of heat addition is presented. (auth)

Refer also to abstract 7347.

MATERIALS TESTING

7243 NYO-3576
New York Operations Office, AEC
MATHEMATICAL FOUNDATIONS OF NON-DESTRUCTIVE TESTING BY EDDY CURRENT METHODS. Richard Hochschild. Mar. 18, 1953. Decl. Jan. 6, 1956. 83p. $0.50(OTS).

The mathematical and physical theory underlying a quantitative description of non-destructive testing by eddy currents is developed and results are discussed in mathematical and non-mathematical terms. Data obtained from the G. E. Metals Comparator and the Cyclograph are analyzed and contrasted to data obtained from instruments in the new Förster group developed in Germany. (F.S.)

VACUUM SYSTEMS

7244 HW-28211
Hanford Atomic Products Operation, Richland, Wash.
A HANFORD WORKS VACUUM SYSTEM. N. T. Hildreth. May 28, 1953. Decl. Feb. 3, 1956. 49p. Contract W-31-109-Eng-52. $7.80(ph OTS); $3.30(mf OTS).

The remodeling, fabrication, and instrumentation of a high vacuum system are described. The faults encountered with the old system and their solution are outlined. Tests were made on diffusion pump oils and on the reduction of pump oil back diffusion. The measurement of high vacuum pressures by a cold cathode ionization gage at various points on a vacuum system are discussed. (auth)

WASTE DISPOSAL

7245 CN-2049
Chicago. Univ. Metallurgical Lab.
WASTE DISPOSAL. Problem Assignment No. 223-X6AS. Final Report for Period July 1, 1944 to Sept. 15, 1944. Nov. 17, 1944. Decl. Feb. 2, 1956. 22p. $4.80(ph OTS); $2.70(mf OTS).

The programs on decontamination of nonmetal wastes; waste neutralization with 50% NaOH; Al precipitation in the coating removal waste; stability of metal waste at elevated temperatures; and settling characteristics of Hanford wastes have been completed and results are summarized. (F.S.)

MINERALOGY, METALLURGY, AND CERAMICS

7246 AECD-4031
National Bureau of Standards, Washington, D. C.
QUARTERLY PROGRESS REPORT TO THE UNITED STATES ATOMIC ENERGY COMMISSION FOR APRIL, MAY, AND JUNE 1954. (NBS-D-129). Decl. Jan. 12, 1956. 74p. $12.30(ph OTS); $4.50(mf OTS).

Construction of a high-energy x-ray image intensifier is reported. Progress is reported in the calibration of radiation detection instruments; studies on the electrodeposition of Be and Be alloys; studies of the heat of combustion of SiC; the thermal stability and effects of radiation on silanes; the synthesis of selenides, aryl sulfides, perfluoroörganic compounds, polynuclear hydrocarbons, meta-linked aromatic compounds, and miscellaneous related compounds; the preparation and phase studies of U–Pt alloys; phase studies on the systems UO_2–Al_2O_3, UO_2–SiO_2, and UO_2–BeO; and the physical properties of UO_2 and ThO_2. (C.H.)

CERAMICS AND REFRACTORIES

7247 KAPL-1340
Knolls Atomic Power Lab., Schenectady, N. Y.
PRETREATMENT OF URANIUM FOR THE APPLICATION OF CERAMIC COATINGS. C. W. Krystyniak and D. D. Crooks. May 4, 1955. Decl. Dec. 2, 1955. 10p. Contract W-31-109-eng-52. $0.15(OTS).

Bonded ceramic coatings are difficult to obtain when the coatings are applied directly to U. Firing in a normal air atmosphere causes excessive oxidation of the U and resultant poor bonding. Inert atmospheres can be used to control this oxidation but are not conducive to good adherence. Electroplates of Cu, Ni, and Ag were applied to U to act as blocking layers to permit air-firing. The need for electroplating has been eliminated by the use of a phosphoric acid, ethylene glycol, ethyl-alcohol electropolishing bath discussed in this report. Air-firing of ceramic coatings directly into U metal has been made possible by this method. (auth)

CORROSION

7248 CF-55-12-22
Oak Ridge National Lab., Tenn.
STOCK USED IN FABRICATION OF STRESSED CORRO-

SION SPECIMENS PROPOSED FOR HRT. R. M. Warner. Dec. 3, 1955. 5p. Contract [W-7405-eng-26]. $1.80 (ph OTS); $1.80(mf OTS).

Corrosion specimen assemblies fabricated from Ti and stainless steel were located strategically throughout the HRT and Huey test results are reported. The chemical analysis, elongation, and tensile and yield strengths of Ti are included. (F.S.)

7249 CT-3726

Argonne National Lab., Lemont, Ill.

EFFECT OF SODIUM–POTASSIUM ALLOY ON VARIOUS MATERIALS AT ELEVATED TEMPERATURES. LeRoy R. Kelman. Dec. 1, 1946. Decl. Dec. 20, 1955. 26p. Contract W-31-109-eng-38. $0.25(OTS).

The corrosive effects of Na–K alloys were investigated at temperatures up to 800°C. Uranium, Th, Be, and Nb showed extremely good resistance to pure Na–K alloy. The presence of O in the Na–K alloy appeared to effect the corrosion resistance of these metals. Pure Fe and low-carbon steels showed good resistance to Na–K alloys and appeared to be suitable metals for the construction of equipment to handle Na–K where structural strength and air corrosion resistance at elevated temperatures are not necessary. The presence of Cr and high-Cr alloys appeared to greatly accelerate the rate of attack of steel by Na–K alloy. Nickel and high-Ni alloys showed extremely good resistance to Na–K alloy. Type 302 stainless steel showed irregular corrosion when tested in Na–K alloy. In general, Cu and its alloys, C, Si, Ag, and Pt were found to be extensively attacked by Na–K. (C.H.)

7250 HW-28129

Hanford Atomic Products Operation, Richland, Wash.

THE INFLUENCE OF MERCURY ON ALUMINUM CORROSION. D. R. de Halas. May 25, 1953. Decl. Dec. 8, 1955. 35p. Contract W-31-109-Eng-52. $0.30(OTS).

A series of tests is described which used a heated recirculating water system containing metallic mercury and various concentrations of mercury ion to determine the pitting tendency of mercury on aluminum slugs. Pits on aluminum caused by mercury are circular in shape, and do not resemble any observed types of in-pile slug pitting. Increasing water velocity increases the total number of pits but not their general shapes. Decreasing the mercury ion concentration decreases the amount of pitting until at about 0.5 ppm at 70°C mercury from the amalgam goes into solution rather than the mercury from the solution depositing on the slugs. In view of these results it is concluded that the possible presence of trace amounts of mercury in the pile process water is not the cause of any significant Hanford pile corrosion problem. (auth)

7251 KAPL-M-WW-2

[Knolls Atomic Power Lab., Schenectady, N. Y.]

THERMAL STRESS IN A BERYLLIUM WASHER. Warren F. Witzig and William A. Riemen. July 1, 1949. Decl. Feb. 8, 1956. 17p. Contract [W-31-109-eng-52]. $3.30 (ph OTS); $2.40(mf OTS).

Thermal stress was produced by a large radial heat flux in a Be washer immersed in a Nak alloy. After 7,000 cycles of thermal stress, the washers maintained its principle dimensions but developed small radial cracks. There was a 2 mg wt gain despite obvious corrosion. (F.S.)

7252 MITG-A80

Massachusetts Inst. of Tech., Watertown, Mass. Mineral Engineering Lab.

CORROSION TESTS IN SULFURIC ACID–FERRIC SULFATE LEACHING OF SILICEOUS ORES. Norman N. Schiff. Oct. 17, 1949. Decl. Apr. 11, 1956. 35p. Contract W-7405-eng-85. $1.80(ph OTS); $1.80(mf OTS).

The stainless steels followed by Hastelloy C and then Duriron have the slowest corrosion rates when subjected to the abrasion of a siliceous ore pulp in a sulfuric acid–ferric sulfate liquor. Lead, usually regarded favorably for sulfate solutions, had a much higher rate but may still be suitable for nonabrasive conditions. (auth)

7253 ORNL-1146

Oak Ridge National Lab., Tenn.

THE EFFECT OF METALLURGICAL VARIABLES ON THE CORROSION OF EXTRUDED BERYLLIUM. Arnold R. Olsen. Apr. 1, 1952. Decl. Jan. 6, 1956. 59p. Contract W-7405-eng-26. $0.40(OTS).

A single vacuum cast and extruded billet of Be was divided into a number of corrosion samples and corrosion tested in simulated MTR coolant for periods up to one year. The samples were segregated as to position in the billet and metallurgical treatment; i.e., leading end, center, and trailing end of the billet, directly machined, annealed and machined, and annealed-machined and annealed. It was found that there is no significant change in corrosion resistance throughout the length of the extrusion. Over-all corrosion attack and pitting rates increased directly with the number of anneals on short time exposures. However, the over-all attack on longer term exposures, up to 12 months, is almost identical regardless of whether the sample has been annealed or not. Further proof of the extreme sensitivity of Be to minor changes in the media was also found. (auth)

GEOLOGY AND MINERALOGY

7254 MITG-230

Massachusetts Inst. of Tech., Cambridge. Mineral Engineering Lab.

PRELIMINARY MINERAL ENGINEERING STUDY OF URANIUM–BEARING ORE FROM THE SUNSHINE MINE, IDAHO. D'Arcy R. George and Robert J. Woody. Mar. 1, 1950. Decl. Jan. 11, 1956. 41p. Contract AT-30-1-Gen-211. $7.80(ph OTS); $3.30(mf OTS).

The uranium in Sunshine ore samples K-1 and K-2 is present as mostly minus one micron particles of pitchblende. The fine grain size of the pitchblende precludes its recovery by methods of physical separation. Leaching with sulfuric acid and various oxidizers gave extractions of 80 to 92% and a uranium concentrate containing 41% was obtained by simple two-stage neutralization of the leach solution. Flotation tests showed that good silver recoveries require the flotation of a bulk sulfide concentrate. (auth)

Refer also to abstract 7226.

METALS AND METALLURGY

7255 AECD-3880

Battelle Memorial Inst., Columbus, Ohio.

THE MACHINABILITY OF BERYLLIUM. E. T. Armstrong, R. W. Dayton, and R. C. Dawes. Apr. 30, 1949. Decl. Jan. 5, 1956. 30p. Contract W-7405-eng-92. (BMI-T-11). $4.80(ph OTS); $2.70(mf OTS).

Tool-wear studies have enabled the evaluation of the comparative machinability of Be. Q-metal is superior to other types of Be from the standpoint of minimizing tool wear. Oriented, extruded Be machined in the direction of extrusion induces less tool wear than cast material. However, the same extruded material machined transversely is comparable in tool wear to cast material. Porous atmosphere-cast material induces greater tool

wear than the other types of Be which were studied. Since this material was quite unsound, this indication is considered of greater interest in connection with possible effects of water vapor on the machinability of Be than in connection with the machinability of a useful type of Be. (auth)

7256 AECD-4048
Massachusetts Inst. of Tech., Cambridge.
Metallurgical Project.
TECHNICAL PROGRESS REPORT FOR THE PERIOD OCTOBER THROUGH DECEMBER 1949. Feb. 8, 1950. Decl. with deletions Jan. 13, 1956. 79p. $12.30(ph OTS); $4.50(mf OTS).

As little as 1/4% Al increases the probability of obtaining crack-free Be castings. Tensile tests, ductility, and sizes of powders have been studied in extruded Be. A description of a creep apparatus and results on creep of Al from 300 to 450°C are given. The recyrstallization of Zr as a function of cold work and annealing time and temperature was studied. Zirconium corrosion studies were made using H_2, N_2, and C additives. (F.S.)

7257 AECD-4127
Battelle Memorial Inst., Columbus, Ohio.
LITERATURE SURVEY OF TREATMENTS FOR MONAZITE SANDS. M. Willigman and E. E. Slowter. Nov. 1, 1947. Decl. Jan. 25, 1956. 41p. Contract AT-30-1-gen-202. (BMI-JDS-1(Suppl.)). $6.30(ph OTS); $3.00 (mf OTS).

All phases of Th recovery starting with crude monazite sands and continuing through to the preparation of metallic thorium are covered in this literature survey. (F.S.)

7258 CT-2960
Iowa State Coll., Ames.
THE URANIUM-MERCURY SYSTEM. D. H. Ahmann, R. R. Baldwin, and A. S. Wilson. Oct. 27, 1945. Decl. Dec. 15, 1955. 21p. Contract W-7405-eng-82. $0.25(OTS).

The U–Hg system has been studied by thermal analysis, vapor pressure-temperature curves and x-ray diffraction. Three compounds exist; UHg_4 which decomposes at 360°C to UHg_3 and Hg(v), UHg_3 which goes to UHg_2 and Hg(v) at 390°C, and UHg_2 which breaks down into U + Hg(v) at 460°C. There appears to be some solubility of U in Hg(l) and of Hg in U but no mutual solubility between the compounds. Because of the pyrophoric nature of the amalgams, all work was done under vacuum or an inert atmosphere. UHg_2 has a hexagonal structure, a = 4.77 Å and c = 3.21 Å with a calculated density of 15.29 g/cc. UHg_3 has a hexagonal c.p. structure, a = 3.30 and c = 4.86 with calculated density of 14.88 g/cc. The structure of UHg_4 has not been determined. (auth)

7259 CT-3439
[Massachusetts Inst. of Tech., Cambridge.]
PROGRESS (A-1) REPORT FOR MONTH OF JANUARY 1946. Feb. 13, 1946. Decl. Jan. 18, 1956. 24p. Contract W-7405-eng-175. $4.80(ph OTS); $2.70(mf OTS).

7260 KAPL-M-JPF-1
Knolls Atomic Power Lab., Schenectady, N. Y.
THE WELDING OF CAPILLARY TUBING USING A HIGH FREQUENCY ARC METHOD. Progress Report. John Frandsen. Sept. 21, 1949. Decl. Feb. 7, 1956. 13p. Contract W-31-109-Eng-52. $3.30(ph OTS); $2.40(mf OTS).

It has beenfound feasible to close the ends of capillary size metal tubing by a high frequency arc welding method described herein. Metal tubing welded by this method includes Fe, Ni, stainless steel, Ti, and Zr. With the same equipment and the addition of a low amperage direct current superimposed on the high frequency, it is possible to weld Mo tubing. Tubing sizes welded have varied from 0.035 in. O.D. × 0.005 in. wall to 0.080 in. O.D. × 0.010 in. wall. (auth)

7261 MCW-177
Mallinckrodt Chemical Works, St. Louis.
[URANIUM METAL VACUUM] REMELT FURANCE PILOT PLANT. William A. Oppold. Apr. 7, 1949. Decl. Jan. 12, 1956. 7p. $1.80(ph OTS); $1.80(mf OTS).

Performances of the vacuum system, remelt furnace, electrical system, and instrumentation of the remelt furnace pilot plant are discussed, and changes needed in certain parts are outlined. (L.M.T.)

7262 NYO-1114
Brush Beryllium Co., Cleveland.
ELEVATED TEMPERATURE PROPERTIES OF BERYLLIUM. K. G. Wikle and W. W. Beaver. July 15, 1952. Decl. Feb. 13, 1956. 23p. Contract AT(30-1)-541. $0.20 (OTS).

The elevated temperature tensile properties of hot-pressed QMV beryllium have been studied from 250 to 950°C. Also those of warm-pressed, hot-extruded beryllium have been investigated from 250 to 600°C. Both materials exhibit a ductility peak at about 450°C while tensile strength decreases with increasing temperature. The results are compared with data reported in the literature on extruded flake and extruded cast beryllium. Special equipment developed for tensile-testing beryllium up to 950°C is illustrated and described. (auth)

7263 NYO-3454
Brown Instruments Div., Minneapolis-Honeywell Regulator Co., Philadelphia.
DEVELOPMENT OF RADIATION PYROMETRY TECHNIQUES FOR MEASUREMENT OF TEMPERATURE DURING THE ROLLING OF URANIUM. C. W. Ricker, H. F. Schaf, and J. V. Werme. May 1, 1953. Decl. Jan. 6, 1956. 79p. Contract AT(30-1)-1316. $0.45(OTS).

A holder and housing for the Brown Miniature Radiamatic Radiation Pyrometer was developed which is flexible and can be used for temperature measurements of U ingots and bars during rolling. A calibration panel, containing a blackbody furnace as a radiation reference source, was designed which permits easy calibration of the Radiamatic assemblies. (F.S.)

7264 NYO-3913
Tufts Coll., Medford, Mass.
[THE DISSOCIATION PRESSURE AND THE NATURE OF URANIUM HYDRIDE AND THE PREPARATION OF TRANSITION METAL HYDRIDES.] PART A. THERMODYNAMIC ESTIMATION OF FEASIBILITY OF CERTAIN REACTIONS LEADING TO U OR UH_3. PART B. PRELIMINARY PREPARATIVE STUDIES. Quarterly Report for Period Ending February 1, 1953. Thomas R. P. Gibb, Jr., Charles E. Messer, and Gordon G. Evans. Feb. 26, 1953. Decl. Dec. 8, 1955. 36p. Contract AT(30-1)-1355. $0.30 (OTS).

Thermodynamic calculations pertaining to the feasibility of 540 reactions leading to U or UH_3 are given. Calculations have been made for the reduction of uranium halides, uranyl halides, oxyhalides and oxides to U or to UH_3 by alkali metals, Mg, Ca, and Al. Three types of reaction have been considered in each case, reducing metal as the sole reducing agent, reducing metal plus H_2 and reducing metal hydride. The results of these calculations are presented in the form of free energy tables. (auth)

7265 Y-644
Oak Ridge National Lab., Y-12 Area, Tenn.
HAFNIUM METAL. I. CONVERSION OF HAFNIUM

OXIDE TO HAFNIUM TETRAFLUORIDE. Joe L. Williams and Boyd Weaver. Aug. 29, 1950. Decl. Jan. 5, 1956. 11p. Contract W-7405-eng-26. $0.15(OTS).

Anhydrous HfF_4, free from significant amounts of oxygen and other impurities, has been prepared by hydrofluorination of ignited HfO_2, followed by vacuum sublimation. The material so produced has been used by the Y-12 Materials Laboratory as raw material for the preparation of pure Hf. A companion report, Document Y-645, by Hagelston, Hutchison, and Lambert, describes the reduction of this material to pure Hf. (auth)

Refer also to abstract 7365.

PHYSICS

7266 A-3447

Saunders (Kerby) Inc., New York.

DEVELOPMENT OF NITROUS OXIDE AS A REFRIGERANT. A. I. McFarlan. Feb. 8, 1945. Decl. Nov. 28, 1955. 29p. $6.30(ph OTS); $3.00(mf OTS)

The steps taken in developing N_2O as a refrigerant are outlined. Results of the development work can be summarized as follows: N_2O was demonstrated to be a workable and very useful refrigerant for temperatures between –70 and 120°F; dry N_2O is noncorrosive; N_2O was found to be stable; data on compression, volumetric efficiencies, and thermodynamic properties were obtained; and a satisfactory compressor design was developed. (M.P.G.)

7267 NYO-5226

[Mallinckrodt Chemical Works, St. Louis.]

THE RATES OF LOSS AND PICKUP OF MOISTURE IN PITCHBLENDE. Joseph R. Simmler. May 20, 1948. Decl. Dec. 8, 1955. 7p. Contract [W-14-108-eng-8]. (MCW-A-82). $0.10(OTS).

Ore samples dried 68 hours at 110°C are assumed 100% dry. With this assumption, samples dried 3 hours at 110°C are 90% dry, and samples dried 24 hours at 110°C are 96% dry. The rate of moisture pickup is rapid, but not as rapid as moisture loss at 110°C. These functions are plotted. (D.E.B.)

7268 SC-3288(TR)

Sandia Corp., Albuquerque, N. Mex.

THE DETERMINATION, APPLICATION, AND LIMITATIONS OF CIRCUIT RELIABILITY EQUATIONS. R. O. Frantik. Apr. 26, 1954. 43p. $7.80(ph OTS); $3.30(mf OTS).

Several different methods, exact and approximate, are described for determining the equations which symbolically state the probabilities that complex circuits operate correctly, fail to operate, or operate prematurely. Consideration is given to the basic assumptions which must be satisfied to permit use of the methods described. Each method is demonstrated by the solution of sample problems. The report shows how the use of reliability equations can aid the circuit engineer in determining the most desirable arrangement of parts of a circuit. Since each method for determining circuit reliability equations has certain advantages or disadvantages, an attempt has been made to show when a given method is most applicable and easiest to use. (auth)

7269 WAPD-FE-1101

Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.

SYMPOSIUM ON SOLAR FURNACES, THEIR DESIGN AND APPLICATION. W. B. Haynes and H. J. Snyder. Oct. 24, 1955. 18p. $3.30(ph OTS); $2.40(mf OTS).

A survey of existing solar furnaces, their salient features and applications, was made to ascertain the advantages and practicabilities peculiar to this type of furnace. In general, solar furnaces have several distinct advantages, outstanding among these are high temperatures, rapid heating, close temperature control, heating in any atmosphere or vacuum, furnace cooling at any desired rate, and generation of pure heat without introduction of combustion gases or electrode contamination. Noteworthy disadvantages of the solar furnaces are limited production capacity, inability to operate the furnace at night or on cloudy days, and high initial investment. (auth)

7270 WAPD-RM-7

[Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.]

THE EFFECT OF DISSOLVED GASES ON THE BUBBLE POINT OF WATER. Paul Cohen and Kenneth Vogel. Feb. 20, 1950. Decl. Aug. 14, 1954. 8p. Contract [AT-11-1-Gen-14]. $1.80(ph OTS); $1.80(mf OTS).

Within the limitations of currently available data, the effect of dissolved hydrogen on the bubble point of water has been expressed as a function of concentration and of total system pressure in the form of a bubble point chart. Improved charts for hydrogen and oxygen mixtures will be required for the control of bubble point by the analysis of the reactor fluid. Because of the complexity of the analytical instrumentation required and the complicated relationship between gas solubility pressure and bubble point, direct measurement of bubble point may be preferable for control purposes. The lines along which a suitable instrument might be developed have been indicated. (auth)

Refer also to abstract 7114.

AEROSOLS

7271 HW-15802

Hanford Works, Richland, Wash.

COLLECTION AND ANALYSIS OF ACTIVE PARTICLES. Chester W. DeLong. Jan. 27, 1950. Decl. Feb. 7, 1956. 12p. Contract [W-31-109-eng-52]. $3.30(ph OTS); $2.40 (mf OTS).

The results are given of a radiochemical analysis of particles collected by electrostatic precipitation from ventilation air of the "B" plant at Hanford Works. (auth)

CRYSTALLOGRAPHY AND CRYSTAL STRUCTURE

Refer to abstract 7368.

INSTRUMENTS

7272 A-3446

Westinghouse Electric Corp. Lamp Div., Bloomfield, N. J.

HIGH SPEED X-RAY TUBE AND CIRCUIT DEVELOPMENT. Final Report [for] July 15, 1944–April 20, 1945. C. M Slack and J. G. Buck. Decl. Jan. 17, 1956. 53p. Contract W-7405-eng-312. $9.30(ph OTS); $3.60(mf OTS).

Development work was undertaken to improve the quality of the high-speed x-ray tube in regard to life, focal spot size, and consistency of x-ray output both in intensity and quality between successive exposures. Extensive experiments with various cathode designs indicate great difficulty in accomplishing these objectives with electrostatic focussing at the cathode but a method utilizing electrostatic charges on bulb and small anode gave promising results, but tube life was greatly shortened. Magnetic focussing is a possible solution to this problem but requires complicated tube structure and experimental set-ups. Equipment

was constructed and assembled for analyzing the various components, such as, voltage, current and output of the tube, but the work was stopped prior to utilization of this equipment. Considerable improvements in life and operating techniques at "Y" have resulted from this contract but the contract was terminated before full accomplishment of all the objectives was obtained. (auth)

7273 AECD-4104
Tennessee Eastman Corp., Oak Ridge, Tenn.
THE STUDY AND CALIBRATION OF P.I.G'S IN TCl_4 VAPOR. C. Scott, H. Q. Fuller, Leo G. Chelfus, and C. Starr. Sept. 28, 1945. Decl. Jan. 25, 1956. 22p. [Contract W-7401-eng-23]. (D-4.250.19). $4.80 (ph OTS); $2.70(mf OTS).

A study of P.I.G.'s in UCl_4 vapor in an all-carbon oven indicated that a $\frac{1}{2}$ inch cathode separation, $\frac{1}{4}$ inch anode diameter P.I.G., operated at 1300 volts and 200,000 ohms series resistance, was the best of those studied for measuring pressure in the J manifold of the all-carbon Beta M2 X unit. It gave a linear function of current versus temperature over a range of 350 to 435°, which corresponds to a vapor pressure range of 0.35 to 30 microns, and operated over a considerable period of time with little growth on the cathode plates. A satisfactory calibration curve of current versus vapor pressure was obtained, and charge consumption rates can now be calculated from P.I.G. readings during operation of an M unit. The P.I.G. measurements in UCl_4 vapor agreed with those obtained in a previous experiment in indicating that the average pressure in the J manifold of the Beta M unit was around 15 microns. (auth)

7274 FMPC-344
National Lead Co. of Ohio, Cincinnati.
DESIGN CHANGE ON THE TWO STONE DRESSING TOOL USED IN DRESSING THE GRINDING WHEEL ON A CONTOUR CENTERLESS GRINDER. Charles J. Michel. Mar. 18, 1953. Decl. Jan. 4, 1956. 9p. Contract AT(30-1)-1156. $0.15(OTS).

A new design for a two-stone dressing tool for the grinding wheel of contour centerless grinder is presented which results in a 66% increase in the life of the tool at a cost increase of 19%. (auth)

7275 HW-26853
Hanford Works, Richland, Wash.
TESTS AND APPLICATION OF DIFFERENTIAL PRESSURE MICROMANOMETER TO 305 BUILDING INSTRUMENTATION. N. T. Hildreth. Jan. 16, 1953. Decl. Feb. 7, 1956. 29p. Contract W-31-109-Eng-52. $4.80 (ph); $2.70(mf).

A micromanometer designed to measure small differential pressures with respect to a stable reference pressure was studied and found unsuitable for use with a current integrator for reading directly the pile reactivity. (F.S.)

7276 HW-33944
Hanford Atomic Products Operation, Richland, Wash.
IN-CELL VACUUM ANNEALING FURNACE. W. S. Kelly and R. E. Hueschen. Dec. 1, 1954. Decl. Jan. 31, 1956. 4p. Contract [W-31-109-Eng-52]. $1.80(ph OTS); $1.80 (mf OTS).

A tube type electric furnace capable of reaching a temperature of 900°C was modified for in-cell use as a vacuum furnace. The furnace was mounted on a solid cell plug to permit easy installation and removal from a cell. Irradiated uranium samples have been successfully annealed at 400°C for 15 hours with a vacuum of approximately 5×10^{-5} mm of mercury. (auth)

7277 LA-1106
Los Alamos Scientific Lab., N. Mex.
PLUTONIUM ELECTROPOLISHING CELL. K. S. Bergstresser. June 30, 1950. Decl. Dec. 7, 1955. 7p. Contract W-7405-eng-36. $0.15(OTS).

Improvements in apparatus and procedure, used in the preparation of bright-surfaced samples of plutonium metal for analytical purposes, have been described. (auth)

7278 LA-1607
Los Alamos Scientific Lab., N. Mex.
A DESCRIPTION OF TWO MOTOR-OPERATED VALVES AND A SPECIAL VALVE PACKING. J. W. Anderson, W. C. Hazen, R. L. Thomas, and W. D. McNeese. Sept. 14, 1953. Decl. Dec. 7, 1955. 18p. Contract W-7405-eng-36. $0.20(OTS).

This report describes normally open or closed type valves, and throttling control valves, developed for use in remote-control equipment where flows are small but precise control is required. These valves were developed to handle such materials as 30% H_2O_2, anhydrous HF, ammonia, solutions, liquids containing solids, and radioactive solutions. A special valve packing used to prevent the build-up of contamination at the valve stem is also described. (auth)

7279 RL-7.6.36
[California. Univ., Berkeley. Radiation Lab.]
ECCENTRICITY METER. J. H. Wiens. May 16, 1945. Decl. Sept. 15, 1955. 6p. Contract W-7405-eng-48. $3.30(ph OTS); $2.40(mf OTS).

The eccentricity meter is designed for making accurate and rapid measurements of the amount of eccentricity of rods. The term rods will be used to include concentric lines, heaters, heater leads, etc. The instrument measures directly the amount, averaged over one inch of the rod length by which the inner conductor departs from the true center. (auth)

7280 RL-7.6.37
California. Univ., Berkeley. Radiation Lab.
OPERATING INSTRUCTIONS [FOR THE ECCENTRICITY METER]. J. H. Wiens. May 16, 1945. Decl. Sept. 15, 1955. 11p. Contract W-7405-eng-48. $3.30(ph OTS); $2.40(mf OTS).

Instructions are summarized for a meter designed for making accurate and rapid measurements of the amount of eccentricity of rods. (B.J.H.)

7281 SC-3004(TR)
Sandia Corp., Albuquerque, N. Mex.
DENSITY GAGE FOR AIR SHOCK-WAVE MEASUREMENTS. P. K. Church and J. W. Valentine. Oct. 15, 1953. 35p. $6.30(ph OTS); $3.00(mf OTS).

A density measuring gage has been developed for use in recording transient air density changes encountered in shock waves from large-order explosions in air. The gage has undergone static, wind-tunnel, and shock-wave tests for variations in density ranging from 0.0004 to 0.0040 slugs/ft^3 and dynamic pressures up to 5 psi. Initial studies indicate that the device is independent of temperature and pressure, responding only to density. Wind-tunnel tests indicate that inaccuracies of the readings are 2% or less even in the presence of air flow past the gage. In addition to shock study use, this device should be of considerable interest to those concerned with industrial process control and similar applications where continuous recording of density values is desired. (auth)

7282 SC-3497(TR)
Sandia Corp., Albuquerque, N. Mex.
HIGH-SPEED DIGITAL-RECORDING SYSTEM. R. O. Ferner, R. D. Jones, and D. G. Palmer. [195?]. 17p. $3.30(ph OTS); $2.40(mf OTS).

A feasibility study of a newly designed digital-recording and data-handling system has been completed. Analogue signals are sampled at a 12.5-kc rate, encoded, and re-

corded in binary serial form at a 100-kc pulse rate on magnetic tape. Laboratory tests of a 3-digit model have demonstrated the feasibility of a multichannel 7-digit system having an accuracy of ±1.0% over a frequency range of 0 to 5 kc. Recorded information is recovered on playback slowly enough to satisfy the input requirements of conventional computing equipment, thereby making possible automatic data reduction. (auth)

Refer also to abstract 7313.

ISOTOPE SEPARATION

7283 AECD-4099
Tennessee Eastman Corp., Oak Ridge, Tenn.
EFFECT OF IRON, COPPER, AND PARTICLES SIZE ON OPERATING CHARACTERISTICS OF CHARGE MATERIAL. A. J. Miller. Aug. 30, 1946. Decl. Jan. 30, 1956. 19p. Contract W-7401-eng-23. (C-2.340.2). $4.80(ph OTS); $2.70(mf OTS).

The uranium tetrachloride charge prepared for the calutron contained a variety of impurities and existed in several colors and states of aggregation. Copper and iron are present at times in fairly high concentrations varying over a wise range from one charge bottle to the next. The size of the particles of UCl_4 depended to a great extent on slight variations in the decomposition treatment to which the individual charge was subjected. In order to determine whether these variations were effecting the performance of the charge in the process units, various chemical tests and visual observations were made on 769 charges before utilization. The results of the tests and observations are arranged in tabular form along with the operating data from the process units. No correlation was obtained. (auth)

7284 AECD-4157
Tennessee Eastman Corp., Oak Ridge, Tenn.
GENERAL REPORT OF STABLE ISOTOPE SEPARATION. W. R. Ketler, L. G. Chelius, and C. P. Keim. Jan. 20, 1947. Decl. Jan. 27, 1956. 30p. Contract W-7401-eng-23. (H-9.252.1). $4.80(ph OTS); $2.70(mf OTS).

The Calutron was successfully employed to separate the stable isotopes of twenty-one elements. The standard Beta M-2 unit modified to handle charge materials of various temperature ranges proved adequate for a majority of separations. The problem of K life has received considerable attention but is still to be solved. Other operational problems are similar in most respects to those of uranium. The E design has, of necessity, varied greatly from the "Beta Gloria" type. A desire to keep construction simple, yet adequate for efficient collection and readily adaptable for use with many elements, has dictated the trend in E design. Water cooling on the receiver pockets was necessary with many of the elements separated. The chemical purification of the separated samples, although following a general pattern, varies with the type of pockets used and the element collected. (auth)

7285 AECD-4185
Tennessee Eastman Corp., Oak Ridge, Tenn.
THE PRODUCTION OF U^{234} BY A MODIFIED CALUTRON. C. R. McKinney. May 21, 1946. Decl. Feb. 14, 1956. Includes appendix (photographs (D-4-250-30A)). 10p. Contract W-7401-eng-23. (D-4-250-30). $1.80(ph OTS); $1.80(mf OTS).

Three and nine-tenths milligrams of U^{234} were produced using a calutron. A Beta-size calutron was modified to produce complete resolution of the U^{234} beam from the U^{235} beam. With Beta charge the U^{234} current was 4×10^{-6} amperes. The samples were collected upon flat pieces of graphite bent to fit the E curve. (auth)

7286 Y-697
Oak Ridge National Lab., Tenn.
THE SEPARATION AND COLLECTION OF U-236 BY THE ELECTROMAGNETIC PROCESS. H. W. Savage and P. E. Wilkinson. Nov. 30, 1950. Decl. Jan. 6, 1956. 136p. Contract W-7405-eng-26. $0.65(OTS).

Equipment is described which was used to separate and collect small, highly enriched samples of U^{236} from a very small quantity of charge material using a special 12-in.-radius calutron. Appended are details of methods used for estimations of product purity, the preliminary experimental program, design of the calutron unit, handling equipment, ion source development, receiver development and beam studies, charge chemistry and recycle operation, the chemical purification of U^{236}, operation of the calutron equipment, and health hazards. (C.H.)

MATHEMATICS

7287 SC-3585(TR)
Sandia Corp., Albuquerque, N. Mex.
THE CHARACTERISTIC-VALUE PROBLEMS FOR THE CYLINDRICAL WAVE-EQUATION. O. G. Owens. Mar. 1, 1955. 32p. $6.30(ph OTS); $3.00(mf OTS).

The main result of this paper is an explicit mathematical formula which enables one to solve a group of physical problems related to diffraction and blast effects. The formula is found by solving the acoustical equation subject to appropriate side conditions corresponding to the geometrical and physical conditions imposed upon the considered phenomena. (auth)

7288 WAPD-PM-38
Westinghouse Electric Corp. Bettis Plant, Pittsburgh.
SOLUTION OF A PARTICULAR CLASS OF LINEAR DIFFERENTIAL EQUATIONS BY MEANS OF ASYMPTOTIC SERIES. G. G. Bilodeau and R. S. Varga. Oct. 1955. 23p. Contract AT-11-1-GEN-14. $4.80(ph OTS); $2.70(mf OTS).

MEASURING INSTRUMENTS AND TECHNIQUES

7289 AECD-3986
Argonne National Lab., Lemont, Ill.
TRAVELING PROBE FOR ZPR-II. D. F. Uecker. Aug. 1953. Decl. with deletions December 21, 1955. 22p. Contract W-31-109-eng-38. $0.25(OTS).

Descriptions are given of a trolley-mounted neutron chamber which can be moved horizontally along a track is raised or lowered. Its performance is briefly discussed. (B.J.H.)

7290 UCLA-199
California. Univ., Los Angeles. Atomic Energy Project.
A RADIO TELEMETERING SYSTEM FOR THE MEASUREMENT OF ATMOSPHERIC RADIOACTIVITY. Frank C. Strebe and William R. Kennedy. May 7, 1952. Decl. Feb. 13, 1956. 22p. Contract AT-04-1-gen-12. $4.80 (ph OTS); $2.70(mf OTS).

A system for the continuous telemetering of atmospheric radioactivity from a remote site is described. Illustrations of the equipment, circuit diagrams, and results obtained during periods of abnormal atmospheric activity are presented. A short description is given of the status of a multi-channel telemetering system, which is under development. (auth)

7291 WAPD-60
Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.
AN ELECTRICALLY ADJUSTED COMPENSATED IONIZA-

TION CHAMBER. H. S. McCreary, Jr. and Robert T. Bayard. Sept. 1952. Changed from OFFICIAL USE ONLY Jan. 20, 1956. 22p. Contract AT-11-1-GEN-14. $0.25 (OTS).

The use of neutron sensitive ionization chambers for neutron flux measurement in nuclear reactors is discussed along with the limitation in neutron detection range because of the gamma ray background in which the chamber must operate. Means of extending this range are also discussed and a new type of compensated ionization chamber is described. The compensation adjustment of this new chamber is made electrically rather than mechanically as in prior compensated chambers. The extension in neutron detection range over that of an uncompensated chamber is of the order of two decades. Frequent adjustment of the compensation is not necessary since the drift is small over a long period of time. (auth)

7292 WAPD-P-657

Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.

GOLD FOIL NEUTRON FLUX MONITORS. E. R. Sanford and P. A. Nicoll. Apr. 1955. 24p. Contract AT-11-1-gen-14. $4.80(ph OTS); $2.70(mf OTS).

A series of experiments have been conducted with gold-foil neutron-flux monitors. The absolute thermal flux in the BNL pneumatic tube facility PN-4, was determined to be 2×10^{12}/cm^2-sec. The BNL and MTR foil counting methods were compared and found to give $(nvt)_{th}$ values consistent within five per cent. One WAPD counting facility was calibrated, relative to BNL and MTR. A second WAPD facility was calibrated utilizing foils irradiated in the ANL standard pile. (auth)

NEUTRONS

7293 AECD-3782

[Knolls Atomic Power Lab., Schenectady, N. Y.]

CURVES FOR CALCULATING THE EFFECT OF FOIL SELF-ABSORPTION AND DOPPLER-BROADENING ON RESONANCE ABSORPTION LINES. G. M. Roe. Aug. 4, 1948. Decl. Nov. 29, 1955. 14p. (KAPL-M-GMR-4). $0.20(OTS).

The results of an approximate treatment of foil self-absorption and Doppler-broadening of resonance absorption lines are given in this memorandum in the form of curves relating the fractional activation, f, to three dimensionless parameters which depend on the temperature, resonance width, peak cross-section, foil thickness, moderator cross-section, geometry, etc. The present memorandum supersedes Memo-GMR-3, and differs from the latter in three respects: an additional term has been included which considerably increases the accuracy for very narrow resonances, the definition of the parameters has been generalized to allow for possible scattering within the foil itself, and the numerical results have been plotted in a more direct and convenient form. (auth)

7294 BNL-265

Brookhaven National Lab., Upton, N. Y.

THE STREAMING OF NEUTRONS IN CARBON STEEL, INCLUDING THE GEOMETRICAL DEPENDENCE. F. J. Shore, R. D. Schamberger, and H. P. Sleeper, Jr. Dec. 1, 1953. Decl. Mar. 19, 1956. 24p. $4.80(ph OTS); $2.70(mf OTS).

A study has been made of the streaming of neutrons through rectangular carbon steel slabs which were placed near the bottom of a water tank. The principal aim of the investigation was to find an empirical relationship correlating the streaming in the steel with the dimensions of the steel. Such a relation was found and is discussed. The validity of the empirical law, however, might conceivably be limited to a particular kind of energy spectrum. Experimental evidence for its independence of the incident energy spectrum is presented. For the purpose of building patches to shield against the streaming neutrons, the shapes of the flux distributions around the end of the slabs are important. Information useful in this connection is given. The data obtained for right circular cylinders are discussed. The connection with the empirical law for rectangular slabs is indicated. A brief study is made of the decreased streaming noted when thin water gaps are included between slabs, and experiments which were done to determine the energy and origin of the streaming component are described. (auth)

7295 BNL-1797

Brookhaven National Lab., Upton, N. Y.

RESULTS OF UNIVAC SURVEY OF THE THERMAL UTILIZATION OF BNL EXPERIMENTAL LATTICES. J. Chernick. Apr. 13, 1954. Decl. Dec. 13, 1955. 37p. $0.30(OTS).

The results of a Univac survey of the intracell flux distributions and thermal utilization of experimental U–H_2O lattices are presented. Comparison with BNL experimental data indicates a strong dependence of the neutron temperature on the water to uranium volume ratio. This result has not been borne out by preliminary flux measurements at WAPD, giving rise to the first major discrepancy between parallel measurements at the two sites. The resolution of this discrepancy is important in view of the significant role of the neutron temperature in reactor design calculations. (auth)

7296 CF-54-8-97

Oak Ridge National Lab., Tenn.

CALCULATION OF FISSION NEUTRON AGE IN $NaZrF_5$. J. E. Faulkner. Aug. 31, 1954. Decl. Dec. 16, 1955. 12p. Contract [W-7405-eng-26]. $0.15(OTS).

7297 CP-51

[Chicago. Univ. Metallurgical Lab.]

INTERACTION OF Be WITH FISSION NEUTRONS. L. Borst, S. K. Allison, J. Wheeler, and A. M. Weinberg. Apr. 29, 1942. Decl. Jan. 17, 1956. 17p. $3.30(ph OTS); $2.40(mf OTS).

To determine whether or not the (n,2n) reaction in Be would produce a net increase in fission neutrons in a power plant, the distribution of In resonance neutrons slowed down from fission energies in a graphite block was measured with and without 2 in. of Be in front of a U_3O_8 slab undergoing fission. The thermal neutrons producing the fissions were obtained by slowing down neutrons from a cyclotron source. The observed distribution without Be was well represented by a Gaussian source of range 36 cm. (corresponding to an initial fission energy of 3 Mev) and a similar sink of range 7.8 cm. The total In resonance intensity with Be was 5% less than without Be. On the assumption that the effect of the Be is entirely due to its different mean free path and moderating power, the In distribution with Be was calculated. Since the m.f.p. as a function of energy is not known for Be, two separate calculations were made using the highest (2.9 cm.) and the lowest (1.80 cm.) possible values for the effective Be m.f.p. Both calculated curves were found to be higher than the observed Be distribution, indicating that at least 10% of the fission neutrons are removed by the Be. Since there are uncertainties in the values of the constants used, the present conclusions are not entirely unambiguous. Improvement in the experimental techniques to remove these uncertainties are suggested. (auth)

7298 HW-27062
[Hanford Works, Richland, Wash.]
NEUTRON DIFFUSION AND RANDOM WALK. G. E. Duvall. Feb. 5, 1953. 9p. Contract [W-31-109-Eng-52]. $1.80(ph OTS); $1.80(mf OTS).

The theory of random walk as applied to neutron diffusion is discussed. The case of a point source of neutrons in an infinite medium is included in an appendix. (B.J.H.)

7299 HW-27737
[Hanford Atomic Products Operation, Richland, Wash.]
MEASUREMENT OF THERMAL BLACKNESS. R. W. Woodruff. Apr. 16, 1953. 15p. Contract [W-31-109-Eng-52]. $3.30(ph OTS); $2.40(mf OTS).

Methods of measuring the thermal blackness of an absorber, which is defined as the ratio of the number of thermal neutrons absorbed to the number of thermal neutrons entering the absorber, by exposing foils at the absorber surface are considered. The result is that such measurements can best be made with foils which absorb all incident thermal neutrons; thus the foil must have a high absorption cross-section if its thickness is not to be excessive. In addition, the activated foil nuclei must produce γ rays which are not appreciably attenuated within the foil. If a material cannot be found which meets these conditions, then thermal blackness must be calculated from measurements of the angular distribution of thermal neutron current densities at the surface of the absorber. (auth)

Refer also to abstract 7318.

NUCLEAR PHYSICS

7300 AECD-3844
Argonne National Lab., Lemont, Ill.
EXPERIMENTAL ... AND THEORETICAL NUCLEAR PHYSICS DIVISIONS REPORT FOR JANUARY, FEBRUARY AND MARCH, [1948]. April 9, 1948. Decl. with deletions Dec. 13, 1955. 83p. Contract W-31-109-eng-38. $13.80 (ph OTS); $4.80(mf OTS).

Resonance scattering data are tabulated. Scattering and transmission cross sections of S are reported. Other neutron scattering experiments are discussed. The properties of the β spectrum of Os^{193} were studied. The β spectrum of Be^{10} is also shown. The depolarization of neutrons is discussed. The magnetic nature of small angle neutron scattering is discussed. Preliminary designs of a neutron chopper are shown. The total neutron cross section curves of polycrystalline compounds CaO, TiC, TlBr, and ZnO are given. Development work on current regulators and vibrator amplifiers is discussed. A metastable state of Sc^{46} was observed. The 1.1-hr and 6.3-hr activities of Hf are discussed. Gamma rays in the Ac^{227} series are discussed. The disintegration of Sb^{124} was studied. The nuclear characteristics of Xe^{137} and Re were also studied. Fission yields in Th^{232} were determined. The recoil Br atoms from pile irradiated ethyl bromide were studied. The use of the reactor as Carlo calculations were made of the flux distribution in CP-4. The theory of closed shells in nuclei is discussed. (B.J.H.)

7301 AECD-4168
Knolls Atomic Power Lab., Schenectady, N. Y.
REPORT OF THE PHYSICS SECTION FOR JUNE, JULY, AUGUST 1955. Decl. with deletions Jan. 6, 1956. 22p. Contract W-31-109-eng-52. $4.80(ph OTS); $2.70(mf OTS).

Progress is briefly reported on the following areas of research: mass, neutron, alpha- and gamma-ray spectrometry; Monte-Carlo calculations of resonance escape; temperature derivation of an average Breit-Wigner resonance; neutron irradiation of semi-conductors, and theory considering the number of atoms displaced by irradiation. (T.W.S.)

7302 AECD-4223
Los Alamos Scientific Lab., N. Mex.
DISPERSION OF THE NEUTRON EMISSION IN U^{235} FISSION. R. P. Feynman, F. de Hoffmann, and R. Serber. [1955?]. Decl. July 15, 1955. 16p. Contract [W-7405-eng-36]. $3.30(ph OTS); $2.40(mf OTS).

Equations are developed which allow the calculation of the average number of neutrons per U^{235} fission from experimental measurements. Experimental methods are described, the results of which give a value of $(7.8 \pm 0.6)^{\frac{1}{2}}$ neutrons per U^{235} thermal fission. (D.E.B.)

7303 AECD-4231
Massachusetts Inst. of Tech., Oak Ridge, Tenn.
Engineering Practice School.
CRITICALITY STUDIES OF INTERACTING CYLINDRICAL SYSTEMS. F. D. Miraldi, J. Farquhar, III, and P. I. Perry. Oct. 29, 1954. Decl. June 1, 1955. 17p. For Carbide and Carbon Chemicals Co. Contract [W-7405-eng-26, Subcontract 70]. (KT-182). $3.30(ph OTS); $2.40(mf OTS).

Results of a study of an interacting system in which the conditions for criticality are given in terms of the concentration of fissionable material and the geometry of the system are presented. Only a single type of geometry is considered, an infinite system in which the fissionable material was contained in cylinders spaced in an equilateral triangular pattern. The cylinder diameter and distance between cylinders thus define the specific geometry of the system. The cylinders were chosen to contain U^{235} dissolved in light water, and the free space between cylinders contained light water only. Since it was important to determine only the conditions which prevail when the multiplication factor equals unity, the results are expressed as a function of geometry and U^{235} concentration only. The general method of calculation consisted of breaking the lattice into unit cylindrical cells. The core of each cell was the cylinder of fissionable material and the surrounding material then composed a light water reflector. Each cell was then treated as a subcritical homogeneous reactor with a reflector by the two group method. Coupling between cells was accomplished by choosing an appropriate boundary condition at the outer cell boundary; namely, that the gradient of the flux equaled zero. (auth)

7304 NAA-SR-Memo-9
North American Aviation, Inc., Los Angeles.
RANGES OF CYCLOTRON PARTICLES IN VARIOUS MATERIALS. E. R. Cohen. Dec. 27, 1949. 6p. $1.80(ph OTS); $1.80(mf OTS).

A table containing range and rate of energy loss of cyclotron particles in a number of materials of interest in nuclear studies is prepared. Methods for applying this data to alloys and compounds of the contained materials are discussed. (D.E.B.)

NUCLEAR PROPERTIES

7305 UCRL-1244(Rev.)
California. Univ., Berkeley. Radiation Lab.
THE RANGES OF FRAGMENTS FROM HIGH ENERGY FISSION OF URANIUM. E. M. Douthett and D. H. Templeton. July 23, 1951. Decl. Jan. 13, 1956. 43p. Contract W-7405-eng-48. $0.30(OTS).

The ranges in Al of several fragments from the fission of U^{238} induced by 18-Mev deuterons and by 335-Mev

protons have been measured by a radiochemical method. The ranges found are of the same order of magnitude as those reported for slow neutron induced fission. The difference in the forward and backward recoil ranges in the deuteron case is consistent with the momentum corresponding to compound nucleus formation. The ranges found in the proton case are shorter than those of the deuteron case, the differences being greater for the lighter fragments. These differences are explained by the change in mass of the complementary fragments, due to evaporation of neutrons prior to fission in the proton case, which causes the observed fragment to receive a smaller fraction of the total kinetic energy. (auth)

NUCLEAR REACTORS

7306 AECD-3818
Oak Ridge National Lab., Tenn.
PROPOSAL FOR A RESEARCH AND ISOTOPE REACTOR AT ORNL. A. H. Snell and A. M. Weinberg, eds. Aug. 17, 1950. Decl. with deletions Dec. 6, 1955. 45p. Contract W-7405-eng-26. $0.30(OTS).

A high flux reactor of the MTR type is proposed for ORNL. The need for and value of such a reactor are discussed, and preliminary design and cost estimates are given. (D.E.B.)

7307 AECD-4013
Brookhaven National Lab., Upton, N. Y.
COMPARISON OF "STAGGERED" AND "SPLIT-FLOW" AIR COOLING SYSTEMS. W. E. Winsche. Apr. 18, 1950. Decl. Jan. 11, 1956. 8p. $1.80(ph OTS); $1.80(mf OTS).

Approximate calculations for the heat transfer requirements in the BNL Reactor are given. (B.J.H.)

7308 AECD-4037
Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.
THEORETICAL CALCULATIONS ON ZPR EXPERIMENTATION. PART II. THE CALIBRATION OF THE SINGLE CENTRAL CROSS CONTROL ROD. H. L. Garabedian. Jan. 18, 1951. Decl. Jan. 16, 1956. 28p. Contract AT-11-1-gen-14. (WAPD-RM-36). $4.80 (ph OTS); $2.70(mf OTS).

A theoretical analysis of the experiment known as the Calibration of 3-in. Cross Control Rod is reported. The experiment provided 29 points on a curve of reactivity versus depth of control rod insertion. An attempt to reproduce this curve theoretically has been quite successful. The theoretical approach involved ten reasonably straightforward criticality calculations, making use of experimental critical data, and the use of perturbation theory to obtain the final reactivity curve. This technique avoids the necessity of calculating the worth of the cross control rod. (auth)

7309 AECD-4044
Oak Ridge National Lab., Tenn.
FURTHER CRITICAL EXPERIMENTS ON A SMALL REACTOR OF ENRICHED U-235 WITH AL-H_2O MODERATOR AND BERYLLIUM REFLECTOR. A. B. Martin and M. M. Mann. Aug. 17, 1948. Decl. with deletions Jan. 6, 1956. 16p. Contract W-7405-eng-26. $3.30(ph OTS); $2.40(mf OTS).

The experimental facilities and operating procedures which have been used in the conduct of critical experiments to study the characteristics of small enriched reactors have been described in MonP-357. The purpose of the present report is to describe briefly certain improvements that have been made in the experimental facilities and to present the results of further measurements on critical masses and spatial neutron flux distributions in Be-reflected reactors having square and thin slab geometries. The critical mass of a reactor having the usual U-Al-H_2O core and no reflector was measured and preliminary experiments to determine the fast neutron flux in these reactors were carried out. (auth)

7310 AECD-4109
Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.
TEMPERATURE DISTRIBUTION IN SPHERICAL PELLETS. G. M. Anderson. May 1953. Decl. Feb. 13, 1956. 35p. Contract AT-11-1-gen-14. (WAPD-RM-188). $6.30(ph OTS); $3.00(mf OTS).

A study is presented of the surface temperature distribution of spherical pellets in a fixed-bed, pellet-type reactor. The temperature near a point of contact is determined experimentally by means of an electrolytic tank analogue. An analytical approach involving the use of the IBM (CPC) calculator is described. Suggestions for further study are included. (auth)

7311 AECD-4143
Oak Ridge National Lab., Tenn.
SUPPLEMENT TO THEORY OF NEUTRON CHAIN REACTIONS. Alvin M. Weinberg and L. C. Noderer. May 26, 1952. Decl. with deletions Jan. 9, 1956. 62p. Contract W-7405-eng-26. $0.40(OTS).

General discussions are given of the theory of neutron chain reactions. These include observations on exponential experiments, the general reactor with resonance fission, microscopic pile theory, and homogeneous slow neutron reactors. (B.J.H.)

7312 AECD-4162
[Clinton Labs., Oak Ridge, Tenn.]
SOME NOTES ON COOLING STREAMS. G. Young. Apr. 9, 1947. Decl. Feb. 13, 1956. 11p. (CL-GY-7). $3.30 (ph OTS); $2.40(mf OTS).

Uniform and variable pile cooling streams are discussed. Beginning with standard formulas for the heat transfer coefficient and friction pressure drop, equations are developed for predicting the efficiency of regular and irregular streams. (D.E.B.)

7313 AECD-4201
Hanford Atomic Products Operation, Richland, Wash.
AUTOMATIC DIGITAL RECORDING OF HANFORD REACTOR OUTLET WATER TEMPERATURES. Final Report. D. E. Stephens. Jan. 30, 1953. Decl. with deletions Dec. 8, 1955. 74p. Contract W-31-109-eng-52. $0.45(OTS).

Instrumentation has been developed which automatically senses thermocouple voltages sequentially at a rate of three per second and records temperatures in digital form as received from an analog to digital converter. The temperatures are typed on a reactor face map and simultaneously coded into perforated tape; data from the coded tape are then transcribed into IBM cards in a form convenient for subsequent calculations. The nearly continuous display of tube power generation has given invaluable assistance in maintaining optimum pile power distributions and the coded data make possible many detailed studies of reactor dynamics, control, and reactivity balances. (auth)

7314 AECD-4210
Oak Ridge National Lab., Tenn.
PACKAGE POWER REACTOR NO. 1—PRIMARY COOLANT SYSTEM CALCULATIONS. W. R. Gall. Apr. 29, 1953. Decl. with deletions Nov. 29, 1955. 29p. Contract [W-7405-eng-26]. $0.25(OTS).

Calculations were made to establish the best flow rate and number of passes through the core of the Package Power Reactor No. 1. Estimates of pumping power and

heat exchanger requirements were also made. Calculations were made at 6, 8.18, and 10 megawatts. It was concluded that for any flow rate greater than 3500 gpm and any power less than 10 Mw, 1000 psia is ample pressure to prevent boiling. The pumping power requirement is less than 50 horsepower even for the smallest pipe size and the highest flow rate. Recommended design data and sample calculations are included. (B.J.H.)

7315 BMI-1016
Battelle Memorial Inst., Columbus, Ohio.
RADIOGRAPHIC PROCEDURES FOR PWR-TYPE FUEL ELEMENTS. David E. Stutz, Merle L. Rhoten, Kenneth D. Cooley, and Samuel A. Wenk. July 11, 1955. Decl. Nov. 30, 1955. 26p. Contract W-7405-eng-92. $0.25(OTS).

As part of an over-all WAPD nondestructive testing program for a potential PWR fuel element, radiographic processes for inspection were studied. Procedures were desired for inspection of the core material for flaws, both at the weld and elsewhere. Procedures were also desired for inspection of the Zircaloy 2 end cap for flaws as well as for inspection for variations of cladding thickness and core upset. Co^{60} was compared with Cs^{137} as an energy source for radiographic inspection of the core material. Cs^{137} was chosen as the better of the two for several reasons. Its energy of 0.660 mev is nearer to the calculated optimum energy of 0.550 mev. As the energy of Co^{60} is 1.3 mev, the shielding of the Cs^{137} would be less difficult. It produces a sharper radiograph as well as one with slightly better contrast. A 5-mil hole in a sample with a 0.250-in. core was detected with the Cs^{137} source. A 25-min exposure at an 18-in. distance with Eastman Type A film is needed with the Cs^{137} source. For examination of the Zircaloy 2 an x-ray machine voltage of 170 kv is recommended for a self-rectified machine. An exposure time of 5 min at a 36-in. distance using Type A film is needed. The samples must be immersed in a lead, or similar, solution to prevent undercutting. (auth)

7316 CF-3067
Chicago. Univ. Metallurgical Lab.
THE EFFECT OF BUBBLING ON THE MULTIPLICATION CONSTANT. II. J. Ernest Wilkins, Jr. June 25, 1945. Decl. Dec. 15, 1955. 9p. Contract W-7401-eng-37. $0.15(OTS).

The result cited in CP-2709 for the change δk in multiplication constant necessary to overcome the effect of bubble production in a homogeneous converter or breeder pile is here generalized to give a result valid for large k. The principal tool is the adjoint system. (auth)

7317 CF-48-7-48
Oak Ridge National Lab., Tenn.
COMPARISON OF NEUTRON FLUX IN HIGH FLUX AND ARGONNE D_2O RESEARCH REACTORS. M. M. Mann and N. M. Smith. June 29, 1948. Decl. Feb. 20, 1956. 6p. Contract [W-7405-eng-26]. $1.80(ph OTS).

Curves are given which incorporate all available data on the thermal neutron distribution in the Argonne D_2O reactor and the MTR Mockup. (B.J.H.)

7318 CF-51-5-98
Oak Ridge National Lab., Tenn.
THEORY OF NEUTRON CHAIN REACTIONS; VOLUME I. DIFFUSION AND SLOWING DOWN OF NEUTRONS, CHAPTERS I–IV. Alvin M. Weinberg and L. C. Noderer. May 15, 1951. Decl. Jan. 11, 1956. 255p. Contract W-7405-eng-26. $1.25(OTS).

A detailed general discussion is given of the theory of neutron chain reactions. Included are discussions of the elementary theory of neutron diffusion, second order diffusion theory, the slowing down of neutrons, and resonance absorption and neutron moderation. (B.J.H.)

7319 CF-51-5-164
Oak Ridge National Lab., Tenn.
NEUTRON FLUX MEASUREMENTS IN THE BULK SHIELDING FACILITY REACTOR. John W. Hill, Jr. May 15, 1951. Decl. Dec. 21, 1955. 33p. Contract [W-7405-eng-26]. $0.30(OTS).

Data from neutron flux measurements in the Bulk Shielding Facility are given in detail. (B.J.H.)

7320 CF-52-3-195
Oak Ridge National Lab., Tenn.
AN EXPERIMENT FOR THE DETERMINATION OF THE RATIO OF THE EFFECTIVE DELAYED NEUTRON FRACTION TO GENERATION TIME FOR A NUCLEAR REACTOR. H. T. Williams. Mar. 24, 1952. Decl. Feb. 7, 1956. 9p. Contract W-7405-eng-26. $1.80(ph OTS); $1.80(mf OTS).

This report describes a possible experiment by which the characteristic quantity β/τ of a nuclear reactor may be measured. (β/τ being the ratio of the effective fraction of delayed neutrons to the generation time). The basis for the experiment and the general procedure were originally worked out by R. Serber and R. P. Feynman in connection with the Los Alamos waterboiler. The experiment involves the use of two fission chambers in or near the core of the reactor, the two chambers being connected through a delayed coincidence counting circuit. This circuit registers a coincidence count whenever a count on one chamber is followed a given length of time later (the "delay time") by a count on the other chamber. A series of counting runs would be made with the reactor operating a constant power, each run using a different "delay time" in the delayed coincidence circuit. In such an experiment one would obtain a delayed coincidence counting rate which is the sum of two rates, one being a "random" rate due to accidental pairs of neutrons, the other being the "coupled" delayed coincidence rate which is due to pairs of neutrons belonging to the same family tree or prompt fission chain. According to the theory, this "coupled" delayed coincidence rate decreases as a e (β/τ) d, where d is the delay time between counters. Essentially, this implies that each chain of prompt fissions initiated by a source neutron decays in time with a rate β/τ. According to the results obtained, it should not be too difficult a task to perform this experiment with the HRE. (auth)

7321 CF-52-5-230
Oak Ridge National Lab., Tenn.
CRITICAL CALCULATIONS FOR HALF-FILLED ISHR SPHERE. M. Tobias and P. Haubenreich. May 16, 1952. Decl. Dec. 7, 1955. 9p. Contract [W-7405-eng-26]. $0.15(OTS).

In the operation of the ISHR, it was hoped that the sphere could be half-filled during start-up, enabling full circulation of solution in all parts of the system. The question arose whether it was possible for the half-filled sphere to become critical at the temperatures and concentrations likely to be employed during startup. Calculations show that at an enrichment of 2.75% and a β (ratio of D_2O molecules to U atoms) of 39, $k_{eff} < 1$ at temperatures above 20°C. Further calculations were made to determine a curve relating percent enrichment (γ) and β for solutions at 100°C. In the course of these studies, it was found necessary to use the volume fraction F of D_2O in D_2O–UO_2SO_4 solutions. A curve of F vs $10^3/\beta$ was determined using density data for D_2O–UO_2SO_4 solutions. Such a curve is believed to be more accurate than that shown by Lansing and Noderer in CF 50-11-41, since the authors of that document had no density data available to them other than for H_2O–UO_2SO_4 solutions. Using their curve k_{eff} = 1 for a solution with 2.75% enrichment and β = 39 at a temperature 52°C. A γ vs β curve at 100°C was calculated

using their F vs $10^3/\beta$ curve and is compared with the curve obtained using $UO_2SO_4-D_2O$ density data. (auth)

7322 CF-54-4-170
Oak Ridge National Lab., Tenn.
FREE CONVECTION IN THE REACTOR POOL (Revised). N. F. Lansing. Apr. 27, 1954. 34p. Contract [W-7405-eng-26]. $0.30(OTS).

A method is described for estimating the heat transfer rate from the coolant to the pool water of the ORNL Research Reactor and various quantities which enter into the computation of the N^{16} concentration in various regions of the pool. (B.J.H.)

7323 CF-54-5-170
Oak Ridge National Lab., Tenn.
CRITICALITY OF $U-235-H_2O-D_2O$ SYSTEMS IN CYLINDRICAL GEOMETRY. S. Visner and L. C. Noderer. May 20, 1954. Decl. Dec. 28, 1955. 12p. Contract [W-7405-eng-26]. $0.15(OTS).

The problem of safely storing large quantities of enriched fuel solution in the HRT dump tanks has motivated criticality studies of long right circular cylinders where the moderator is H_2O, D_2O, or various mixtures of the two. Since the tank may be flooded on the outside during maintenance work, the pipes are considered to have an infinite H_2O reflector. Also, the effect of coating the pipes with a poison for thermal neutrons, say cadmium, has also been considered. The linear concentration in kg U^{235} per linear foot has been adopted here as a useful unit of concentration. This has the advantage of remaining constant in a horizontal pipe for a given charge of U, independent of the quantity of solvent. The results indicate that for any mixtures of H_2O and D_2O, there is a diameter for which the linear concentration is a minimum. As the mole fraction of D_2O in the moderator is increased, the minimum linear concentration decreases and occurs at larger diameters. These minima are summarized. (auth)

7324 CF-54-6-200
Oak Ridge National Lab., Tenn.
TEMPERATURE COEFFICIENTS AND MAXIMUM RATES OF INCREASE OF REACTIVITY FOR HRT. V. K. Paré. June 15, 1954. Decl. Nov. 30, 1955. 7p. Contract [W-7405-eng-26]. $0.15(OTS).

The methods used for calculating the temperature coefficients and reactivity and briefly described, as is the accuracy of the results. Detailed results are given both in graphical and tabular form. (B.J.H.)

7325 CF-54-7-105
Oak Ridge National Lab., Tenn.
REACTOR RADIATIONS THROUGH SLABS OF GRAPHITE. R. G. Cochran, J. D. Flynn, K. M. Henry, and G. Estabrook. July 30, 1954. Decl. Dec. 1, 1955. 22p. Contract [W-7405-eng-26]. $0.20(OTS).

Measurements have been completed to determine the attenuation of large thicknesses of graphite next to a reactor. These measurements are of interest for evaluating a graphite reflector as a shield component, and they also provide a direct comparison with LTSF determinations of the carbon removal cross section. Graphite thicknesses of 1, 2, and 3 ft were used, and the usual gamma-ray, thermal-neutron, and fast-neutron dose measurements were made behind each slab thickness. In addition, the fast-neutron spectrum (above 1.3 Mev) through 1 ft of graphite was measured. (auth)

7326 CF-54-10-176
Oak Ridge National Lab., Tenn.
STAINLESS STEEL UNIVERSITY REACTOR. W. E. Kinney. Oct. 30, 1954. Decl. Nov. 29, 1955. 9p. Contract [W-7405-eng-26]. $0.15(OTS).

A study was undertaken to determine the heat transfer characteristics and critical mass of a swimming pool type reactor with stainless steel substituted for Al in the fuel plates. It is required that the fuel plates be less than 50 wt.% UO_2, $k_{eff} \sim 1.05$, and the power be between 0.1 and 1.0 Mw. Standard swimming pool reactor dimensions were used except for the fuel plates which had 20-mil cores and 5-mil coatings. The heat output of the central element of the 5×5 loading was calculated to be 3.43×10^4 BTU/hr. A graph of the central plate surface temperature for 1 Mw operation as a function of the number of plates per element is given. It was found that 10 plates per element is the minimum number for nonboiling operation and natural convection cooling. Results in the form of graphs are also given for the maximum power for nonboiling as a function of number of plates per element with natural convection cooling, the required velocity for forced cooling as a function of plates per element, the maximum power for nonboiling as a function of coolant velocity, and the mass U^{235}/plate as a function of k for a cylindrical model. (B.J.H.)

7327 CF-55-11-35
Oak Ridge National Lab., Tenn.
AQUEOUS HOMOGENEOUS REACTORS FOR PRODUCING CENTRAL STATION POWER. R. B. Briggs. Nov. 8, 1955. 20p. Contract W-7405-eng-26. $3.30(ph OTS); $2.40(mf OTS).

General technology of aqueous homogeneous reactors for central station application is presented. Problems of design and operation of circulating fuel reactors are considered in the discussion of the design of a 100-megawatt power station. (auth)

7328 CF-55-11-42
Oak Ridge National Lab., Tenn.
STUDY OF EFFECT OF SUDDEN HEATING OR COOLING ON HRT MAIN HEAT EXCHANGERS AND POSSIBLE PROTECTIVE MEASURES. Roy C. Robertson. 14p. Contract W-7405-eng-26. $3.30(ph OTS); $2.40(mf OTS).

A study was made on the effect of sudden heating or cooling on the elastic limit of the HRT main heat exchangers. Stresses due to sudden cooling due to incoming feedwater, sudden heating by steam, and sudden loss of steam pressure in the vessel are discussed. Procedures are outlined for protection against these conditions. (C.H.)

7329 CF-55-11-62
Oak Ridge National Lab., Tenn.
TEST OF HRT CELL. Preliminary Report. J. N. Robinson. Nov. 9, 1955. 9p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

The HRT cell was pressure tested and proven to be capable of containing a static gas pressure of 30 psig. The test is described and typical data are presented. (auth)

7330 HW-22679
[Hanford Works, Richland, Wash.]
MEASUREMENT OF ABSOLUTE FLUX IN THE TEST PILE. J. W. Culvahouse and W. B. Farrand. Nov. 12, 1951. Decl. Feb. 6, 1956. 8p. Contract [W-31-109-eng-52]. $1.80(ph OTS); $1.80(mf OTS).

The Hanford Test Pile has been calibrated against the Hanford Standard Pile, hereafter referred to as HSP. The thermal flux in the two piles was compared by means of gold foils irradiated in each pile. The flux (nv) at a point 15 feet 7 inches from the front face of the pile, in graphite stringer number 9 at a level galvanometer deflection of 19.90 cm, is $2.21 \pm 0.17 \times 10^6$ neutrons sec^{-1} cm^{-2}. The Ra–Be source which is used in HSP, was calibrated by Argonne National Laboratory with a precision of only 7 per cent. This is the source of the greater part of the uncertainty in the Test Pile flux. (auth)

7331 HW-23118
[Hanford Works, Richland, Wash.]
SUPPLEMENT TO DOCUMENT HW-21374—MULTIPLICATION CONSTANTS FOR HANFORD TYPE LATTICES: GRAPHITE OF VARIABLE DENSITY. Richard C. Dahlberg. Dec. 28, 1951. Decl. Feb. 8, 1956. 5p. Contract [W-31-109-eng-52]. $1.80(ph OTS); $1.80(mf OTS).

Multiplication constants were calculated for Hanford-type lattices using graphite of various densities. The results are given in tabular form. (B.J.H.)

7332 HW-25581
[Hanford Works, Richland, Wash.]
A TWO-GROUP CALCULATION OF THE TRANSIENTS IN AN EXTERNALLY DRIVEN REACTOR WITH REFLECTOR. Edwin Norbeck. Sept. 9, 1952. Decl. Feb. 20, 1956. 13p. Contract [W-31-109-eng-52]. Charge $3.30 (ph); $2.40(mf).

Expressions for the fast and thermal flux in the core of an externally driven, symmetrical infinite slab reactor with a reflector are derived as a function of the reflector thickness. The driver is represented by an inward current of fast neutrons through the outer boundary of the reflector. The flux distribution curve is plotted for several values of reflector thickness. The object is to determine the effect of changing reflector thickness on the flattening of the flux inside of the core of such a reactor. (auth)

7333 HW-28038
Hanford Atomic Products Operation, Richland, Wash.
A STUDY OF THE FAST TO SLOW NEUTRON FLUX RATIO IN THE CORE OF AN EXTERNALLY DRIVEN REACTOR. E. J. Seppi. May 12, 1953. Decl. Apr. 12, 1956. 9p. Contract [W-31-109-eng-52]. $1.80(ph OTS); $1.80(mf OTS).

Using two-group theory an infinite slab reactor consisting of a core, an inter-reflector, a layer of fissionable material, and an outer-reflector, is studied. The ratio between the fast and slow neutron flux in the core is examined as a function of the thickness of the inter-reflector. This relationship is studied with and without the presence of the outer-reflector at various values of thermal neutron absorption by the fission layer. The general shape of the core flux distribution curves is given at various values of the inter-reflector thickness. Curves from which the general shape of the flux distribution curves can be deduced are given for various conditions. (auth)

7334 HW-29135
Hanford Atomic Products Operation, Richland, Wash.
MEASUREMENT OF NEUTRON FLUX SPECTRA INSIDE REACTORS. R. E. Heineman. Aug. 26, 1953. Decl. Apr. 9, 1956. 10p. Contract [W-31-109-eng-52]. $1.80(ph OTS); $1.80(mf OTS).

The problem of measuring the neutron spectrum inside a reactive lattice in the epi-thermal resonance and fast regions is discussed in the light of experiments reported in the literature up to the present time. It appears that foil activation techniques, relying upon sharp changes in isotopic cross-sections with energy, are the only reliable methods available. These techniques give data which, in general, is neither very accurate nor sensitive. In the resonance region the lack of isotopes having isolated, high cross section resonances with favorable half-lives leads to a deficiency of experimental data. In the high energy threshold detector region the cross-sections of the threshold reactions are not well enough known to give high accuracy. Future work with fission threshold detectors might improve the spectrum in the latter region. (auth)

7335 HW-31647
[Hanford Works, Richland, Wash.]
HORIZONTAL CONTROL RODS FOR H PILE. H. W. Ritchey. Sept. 29, 1948. Decl. Feb. 8, 1956. 3p. $1.80 (ph OTS); $1.80(mf OTS).

Procedures are outlined for flame spraying coatings of boron oxide and Al powder on Al tubes. These procedures are recommended for the processing of Hanford H reactor control rods. (B.J.H.)

7336 HW-32069
Hanford Atomic Products Operation, Richland, Wash.
AGE CALCULATIONS FOR LATTICES WITH ALUMINUM-MATRIX SLUGS. Herschel Neumann. June 8, 1954. Decl. Feb. 20, 1956. 2p. Contract [W-31-109-Eng-52]. $1.80(ph OTS); $1.80(mf OTS).

Age calculations were carried out for 4 Hanford exponential lattices containing Al-matrix, and the results are tabulated. (B.J.H.)

7337 KAPL-311
Knolls Atomic Power Lab., Schenectady, N. Y.
REACTOR DESIGN AND CONSTRUCTION. Section V of Progress Report No. 43 for February 1950. Mar. 14, 1950. Decl. Feb. 15, 1956. 21p. Contract W-31-109-eng-52. $4.80(ph OTS); $2.70(mf OTS).

Estimates of costs for the reactor building, service buildings and waste handling areas of the KAPL Intermediate Power Breeder and the status of all parts of the construction program were summarized. (F.S.)

7338 M-4166
[Clinton Labs., Oak Ridge, Tenn.]
AIR ABSORPTION BY COOLING WATER IN HETEROGENEOUS PILE. G. Ascoli. July 28, 1947. Decl. Feb. 13, 1956. 4p. $1.80(ph OTS); $1.80(mf OTS).

Estimates are given for the amounts of air that will be absorbed by reactor cooling water in the reservoirs and seal tank. Absorption in the reservoirs would be small (<0.2 cfm). If water in the seal tank flows over a weir with a fall of 30 ft, as proposed, no upper limit short of saturation could be estimated. (F.S.)

7339 M-4412(Pts. IV & V)
Ferguson (H. K.) Co., New York.
BROOKHAVEN NATIONAL LABORATORY DESIGN MANUAL. BOOK NO. 1. VOLUME 3. PARTS IV AND V. PILE. Apr. 1949. Decl. Feb. 2, 1956. 213p. (HKF-8 (Pts. IV & V)). $34.80(ph OTS); $9.90(mf OTS).

Part IV. The fuel for the Brookhaven Reactor consists of natural U slugs contained in Al cartridges. Thirty-three slugs are contained in a single finned Al cartridge 11 ft long. The void space in the cartridges is filled with He under pressure, and they are connected by a manifolding arrangement which permits prompt detection of leaks. The fuel assembly is described in detail. Part V. The heat generated in the reactor is removed by a stream of filtered atmospheric air, which is drawn through the pile gap and channels, filtered again, cooled, and discharged by centrifugal fans through a stack to the atmosphere. The entire cooling system is discussed from a functional viewpoint. A detailed description is included of the inlet filters, inlet ducts, exhaust plenums and exhaust ducts, exhaust filters, exhaust air coolers, and silencer. 45 illustrations. (C.H.)

7340 M-4417
Ferguson (H. K.) Co., New York.
BROOKHAVEN NATIONAL LABORATORY PROCESS INSTRUMENTS MANUAL. BOOK 4, VOL. I. Mar. 1949. Decl. Feb. 2, 1956. 276p. For Brookhaven National Lab. Contract [AT-30-2-gen-16]. (HKF-13). $59.40(ph OTS); $11.10(mf OTS).

This manual covers instrumentation related to measurement and control of process variables, such as pressure, temperatures, and flow rates, in the cooling system of the

Brookhaven Reactor. The manual is divided into seven chapters, each chapter describing the instruments in one process system or in one instrumentation system. A general description of process instruments is followed by descriptions of instruments for primary air system measurements, primary air flow control, heat balance calculations, secondary air system measurements, cooling water system measurements and control, and helium leak detection. 49 illustrations. (C.H.)

7341 MonP-379
[Clinton Labs., Oak Ridge, Tenn.]
XENON INSTABILITY PERIODS AS A FUNCTION OF FLUX IN THERMAL PILES. K. O. Donelian and J. R. Menke. Sept. 10, 1947. Decl. Dec. 7, 1955. 6p. Contract W-35-058-eng-71. $1.80(ph OTS); $1.80(mf OTS).

The dependence of the Xe^{135} period on the pile flux level is calculated. A plot of Xe^{135} instability periods as a function of thermal flux indicates fluxes of 10^{16} are obtainable. Temperature effects are not considered. (D.E.B.)

7342 NAA-SR-30
North American Aviation, Inc., Los Angeles.
GENERAL REACTOR SITE SURVEY OF THE LOS ANGELES AREA. R. G. Chalker. June 1, 1949. Decl. Dec. 6, 1955. 52p. Contract AT-11-1-Gen-8. $0.35 (OTS).

7343 NAA-SR-Memo-122
North American Aviation, Inc., [Downey, Calif.].
THE LONG TERM EFFECTS OF THE VARIOUS ISOTOPES IN FUEL RODS ON THE MULTIPLICATION CONSTANT OF A PLUTONIUM PRODUCING REACTOR. Lawrence B. Robinson. [nd]. Decl. Apr. 11, 1956. 16p. $3.30(ph OTS).

Graphs are given in which K, the neutron multiplication constant, and ΔK are plotted as a function of the integrated neutron flux. The amounts of U^{238}, U^{235}, Pu^{239}, Pu^{240}, and the ratio of Pu^{240} to Pu^{239} are also given as a function of the integrated neutron flux. Pu^{239} and Pu^{240} are given as a function of time in years for fluxes of 10^{12} and 10^{13} neutrons/cm^2/sec. (auth)

7344 NAA-SR-Memo-138
North American Aviation, Inc., [Downey, Calif.].
COOLING SYSTEMS FOR LPR. D. L. Hetrick. May 14, 1951. Decl. Apr. 11, 1956. 3p. $1.80(ph OTS); $1.80 (mf OTS).

Three methods of cooling, center cooling, outer surface cooling, and both, are considered for the LPR core. Temperature as a function of diameter is plotted for the three cases. (D.E.B.)

7345 NAA-SR-Memo-149
North American Aviation, Inc., Downey, Calif.
SOME NOTES ON THE ELEMENTARY THEORY USED IN THE PRELIMINARY STUDY OF THE CONVERTER REACTOR. Ralph Balent. Nov. 30, 1951. Decl. Mar. 27, 1956. 5p. Contract [AT-11-1-gen-8]. $1.80(ph OTS); $1.80(mf OTS).

7346 ORNL-113
Oak Ridge National Lab., Tenn.
THERMAL STABILITY OF MULTIPLATE ASSEMBLIES. Final Report—Problem Assignment No. TX12-5. W. B. Allred, G. Ascoli, and H. C. Savage. July, 1948. Decl. Jan. 7, 1956. 52p. Contract W-7405-eng-26. $0.35(OTS).

Thermal stability of LITR plate-type fuel assemblies was experimentally and theoretically investigated. Maximum stress of 2800 psi and maximum plate expansion of 0.025 in. were measured, both within tolerance. Calculated temperature patterns expected under operating conditions are given. (D.E.B.)

7347 ORNL-167
Oak Ridge National Lab., Tenn.
CRITICAL EXPERIMENTS FOR THE HIGH FLUX REACTOR. A. B. Martin and M. M. Mann. Oct. 22, 1948. Decl. Jan. 9, 1956. 39p. Contract W-7405-eng-26. $0.30(OTS).

The series of criticality studies for the Materials Testing Reactor Mockup are summarized. Data are presented on the excess reactivity of U–Al–H_2O, reactors with a Be reflector, as a function of geometry and reflector composition. The effects of experimental holes through the reflector on the reactivity were also studied. Spatial distributions of thermal and epithermal neutron flux in the assembly were measured and are shown. Data on the γ heat production in the reflector are given in graphical form. The effectiveness of control rods of various sizes was also studied. Neutron flux measurements were also made between two Th rods and in a Be block. (B.J.H.)

7348 ORNL-360
Oak Ridge National Lab., Tenn.
A DISCUSSION OF LIQUID METALS AS PILE COOLANTS. A. S. Kitzes. Aug. 10, 1949. Decl. Jan. 5, 1956. 41p. Contract W-7405-eng-26. $0.30(OTS).

Criteria given for evaluating liquid metal coolants are corrosion, nuclear properties, availability and cost, radiation stability, heat-transfer properties, and health hazards. Lithium, Na, NaK, Pb–Bi and Ga were considered as the liquid metals most suitable to be studied as coolants. (F.S.)

7349 UCRL-1633
California. Univ., Berkeley. Radiation Lab.
DRIFT TUBE MODEL MAGNET REPORT. D. Sewell and H. Parmentier. June 27, 1952. Decl. Feb. 16, 1956. 38p. Contract W-7405-eng-48. $6.30(ph OTS); $3.00(mf OTS).

Tests on the final models of the magnets that are designed for the magnetic lenses in the drift tubes of the Mark I Materials Testing Accelerator are discussed. The tests carried out on the magnets include current vs. magnetic field, field vs. position on the axis, and forces between magnets parallel to the axis of the accelerator and perpendicular to the axis of the accelerator. (J.E.D.)

7350 WAPD-CP-1030
[Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.]
RESULTS OF BETTIS TEST FACILITY HYDROGEN DEGASIFICATION TEST. BTF Special Test No. 4. C. S. Caldwell. [nd]. 11p. Contracts AT-11-1-gen-14 and NObs-56404. $3.30(ph OTS); $2.40(mf OTS).

Knowledge of the gas removal efficiency of an STR-type degasifier under controlled operating conditions was required in order to predict the performance of a larger degasifier of similar design which might be proposed for PWR. The hydrogen degasification efficiency of the BTF pressurizer-degasifier unit was found to be 82 ± 5%. The duration of the test was 7 hours, and analysis of water samples was carried out hourly. Inert gases remained below 0.3% during the entire run; hence, the removal efficiency is that for H_2 alone. The results confirm the prediction that approximately single-stage vapor-liquid contact occurs in the vent condenser. (auth)

7351 WAPD-TH-138
[Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.]
AVERAGE SURFACE HEAT TRANSFER COEFFICIENTS FOR A CROSSED PLATE ARRAY. J. R. Parrette and R. E. Grimble. [Oct. 7, 1955]. 15p. $3.30(ph OTS); $2.40(mf OTS).

Using a transient technique, air flow tests were conducted on crossed-plate matrices to determine average surface heat transfer coefficients. Both round-ended and square-ended plate arrangements were investigated in the Reynolds number ranges 18,000 < Re < 90,000 and 18,000 < Re < 55,000, respectively. The ratio of length-to-equivalent diameter for each segment of both arrays was 5.55. Average Nusselt numbers found lie about 40% (round-edged) and 80% (square edged) above the asymptotic values accepted for full-length channels. The data were successfully correlated using analyses based on treating each segment of the array as a separate entrance region. (auth)

Refer also to abstracts 7146, 7147, 7289, and 7352.

NUCLEAR TRANSFORMATION

7352 NAA-SR-Memo-186
North American Aviation, Inc., [Downey, Calif.]
PLUTONIUM PRODUCTION IN FUSED FLUORIDE CAPSULES BOMBARDED BY DEUTERONS. R. L. Ashley. [nd]. Decl. Apr. 11, 1956. 4p. $1.80(ph OTS); $1.80(mf OTS).

Calculations are made of the amount of Pu produced in fused fluoride capsules bombarded with deuterons. The reaction to be considered is $U^{238}(d,p)\ U^{239} \rightarrow Np^{239} \rightarrow Pu^{239}$. It is concluded that the amount of Pu produced is relatively harmless. (B.J.H.)

RADIATION ABSORPTION AND SCATTERING

7353 CF-54-9-120
Oak Ridge National Lab., Tenn.
PRELIMINARY REPORT ON THE PENETRATION OF COMPOSITE SLABS BY SLANT INCIDENT GAMMA RADIATION. C. D. Zerby. Sept. 21, 1954. 12p. Contract W-7405-eng-26. $3.30(ph OTS); $2.40(mf OTS).

A summary is given of the data obtained from a Monte Carlo calculation to determine the number and final energy of incident photons that penetrate or are reflected from a finite thick slab of infinite extent. (B.J.H.)

RADIATION EFFECTS

7354 NAA-SR-121
North American Aviation, Inc., Downey, Calif.
EFFECT OF CYCLOTRON IRRADIATION ON CREEP OF ALUMINUM. H. P. Yockey, M. R. Jeppson, and R. D. Keen. June 8, 1951. Decl. Jan. 13, 1956. 31p. Contract AT-11-1-GEN-8. $0.25(OTS).

A suppression of the creep rate in 99.99% pure Al wire due to the effects of irradiation by a 38-Mev α particle beam was found. A comparison was made in 27 cases, of the creep rate with beam to the creep rate within beam for the same specimen at neighboring time intervals and at the same temperature. In each case there was a suppression of the creep rate which amounted to a factor of two in some instances, or as much as a factor of eight, depending on the evaluation of experimental errors. Evidence is given to show that this effect is probably not due to temperature changes. (auth)

7355 WAPD-RM-50
Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.
DEPENDENCE OF NET WATER DECOMPOSITION ON FLUX. R. F. Newton. May 10, 1951. 4p. $1.80(ph OTS); $1.80(mf OTS).

Estimates of H_2O decomposition by neutron irradiation are briefly outlined. (B.J.H.)

RADIOACTIVITY

7356 AECD-3998
Oak Ridge National Lab., Tenn.
SUMMARY OF SURFACE DECONTAMINATION EXPERIENCE AT OAK RIDGE NATIONAL LABORATORY. F. N. Browder. Nov. 1943 through July 1948. Decl. with deletions Jan. 5, 1956. 38p. Contract W-7405-eng-26. $6.30(ph OTS); $3.00(mf OTS).

In the course of five years experience at Oak Ridge National Laboratory, it has been found that all impervious materials such as stainless steel, mild steel, lead, glass, certain plastics, and certain surface coatings can be decontaminated by vigorous washing with the proper reagents. Each decontamination operation is carried out by starting with mild reagents (water) and increasing the severity of the treatment until the desired decontamination is obtained. Porous materials such as bare concrete, wood, and some plastics have been impossible to decontaminate satisfactorily except by the physical removal of the contaminated portions. (auth)

7357 AECD-4096
Industrial Hygiene Foundation of America, Inc., Pittsburgh.
MEASUREMENT AND CONTROL OF RADIOACTIVE PARTICULATE CONTAMINATION. Summary Report. Theodore F. Hatch. [nd]. Decl. with deletions Jan. 13, 1956. 22p. $4.80(ph OTS); $2.70(mf OTS).

The measurement and control of radioactive particulate matter by AEC installations are summarized. Accepted atmospheric tolerance levels are listed. The methods and requirements for sampling particulate contamination are surveyed. Devices such as the cascade impactor and the multi-stage impinger are described. Control requirements for particulate contamination are also listed. (B.J.H.)

7358 CN-2208
Clinton Labs., Oak Ridge, Tenn.
EQUIPMENT DECONTAMINATION. Final Report for Period July 15, 1944 to December 1, 1944 on Problem Assignment No. 242-X21AS. Jan. 2, 1945. Decl. Feb. 14, 1956. 12p. Contract W-7405-eng-39. $3.30(ph OTS); $2.40(mf OTS).

Stainless steel test pieces from semi-works and plant process vessels, covering a wide range of contamination, were decontaminated by the recommended procedure, both with and without tartrate or other addition agents in the NaOH used. The decontamination factors (DF's) obtained were all in the range 50 to 200. The addition of tartrate to the NaOH increased the DF nearly four-fold in the case of test pieces from the plant tank 31 (1st decontamination cycle precipitator) but was without effect on the other test pieces, from plant tank 21 (extraction precipitator) and the semi-works' extraction catch tank and neutralizer. None of the other addition agents tested (citrate, borax, mannitol, glycerine) increased the DF on any of the test pieces. Treatments with borax, mannitol or Calgon by themselves, without alkali, were also ineffective. Satisfactory decontamination of certain counting instruments made primarily of brass and mild steel was obtained without excessive attack by brief immersion of the brass and mild steel parts separately in 6N (30%) HNO_3 at 65°C. The recommended Tapoganth–$CaCl_2$ water-soluble paint, with and without the addition of 5% glycerine, was tested on plant cell 4 surfaces and on small panels in dessicators. Neither formulation was satisfactory for both extremes of humidity so the choice must depend on the humidity extreme anticipated. The Tapoganth–$CaCl_2$ paint, without glycerine, was satisfactory for the high-humidity conditions prevailing in the Clinton plant cell 4, and for intermediate humidities

but flaked off within 24 hours at 0 to 10 or 20% relative humidity in the dessicator and in previous outdoor tests. The paint with 5% glycerine added was satisfactory for long periods at zero and up to about 71 to 84% relative humidity, at or above which it absorbed sufficient moisture from the air to run off within 24 to 48 hours. Tests with intermediate amounts of glycerine, and with other plasticizers, looked less attractive. (auth)

7359 HW-28924

[Hanford Atomic Products Operation, Richland, Wash.]
Ru^{106}–Rh^{106} ACTIVITY. L. R. Boyd. Aug. 4, 1953. 8p. Contract [W-31-109-Eng-52]. $1.80(ph OTS); $1.80(mf OTS).

A double-focusing magnetic-type spectrometer was used to study the radiations from a Ru^{106} – Rh^{106} source mounted on a mica strip. A Kurie plot analysis, momentum plots, internal conversion peaks, and the decay scheme of Rh^{106} are shown. (B.J.H.)

7360 K-663

Carbide and Carbon Chemicals Div. K-25 Plant, Oak Ridge, Tenn.
SPECIFIC ALPHA ACTIVITY OF U-235. G. B. Knight. Aug. 25, 1950. Decl. Feb. 8, 1956. 12p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

The specific alpha activity of U^{235} has been redetermined. This determination utilized a U^{235} sample of high isotopic purity [(99.94 ± 0.05%)] which was alpha counted in 50% geometry ion chambers then subjected to alpha pulse height analysis to determine the fraction of its alpha disintegrations due to the U^{235} present. The value for the specific alpha activity so determined is 4483.8 ± 131.4 d/m/mg of elemental U^{235}, corresponding to a half-life of (7.53 ± 0.22) × 10^8 years. (auth)

7361 MonT-154

[Clinton Labs., Oak Ridge, Tenn.]
ABSORPTION AND DESORPTION OF ARGON AND XENON ON A TROMBONE COOLER. Progress Report [on] Problem Assignment No. TX5-12. G. W. Haldeman, J. R. Donovan, and J. L. Balderston. Aug. 9, 1946. Decl. Jan. 27, 1956. 29p. Contract W-35-058-eng-71. $4.80(ph OTS); $2.70(mf OTS).

Coefficients were determined for the absorption and desorption of radioactive Xe^{133} and A^{41} with water flowing over a trombone cooler bank made from 3-inch pipes separated by 2-inch fins. For the system investigated both absorption and desorption coefficients may be calculated in the range of Reynold's numbers from 1000 to 4000 using the equation $k_L/D = 160\ (4\Gamma/\mu)^{0.94}\ (\mu/\rho D)^{0.47}$. (auth)

SHIELDING

7362 HW-26574

[Hanford Works], Richland, Wash.
HEAVY AGGREGATE INVESTIGATION. R. E. Brown. Dec. 19, 1952. 11p. Contract [W-31-109-Eng-52]. $3.30 (ph OTS); $2.40(mf OTS).

A survey was made of minerals and mineral products which might be used and are available for high-density concrete aggregate for reactor construction. The results are listed, and sources for additional information are also given. (B.J.H.)

TRACER APPLICATIONS

7363 HW-30262

[Hanford Atomic Products Operation, Richland, Wash.]
NATURAL TRITIUM AS A TRACER FOR UNDERGROUND WATER MOVEMENT—A FEASIBILITY REPORT. H. G. Rieck. Nov. 2, 1953. 13p. Contract [W-31-109-Eng-52]. $3.30(ph OTS); $2.40(mf OTS).

A study was undertaken to determine the feasibility of using tritium present in contemporary water as a tracer to establish the extent of ground water penetration by surface-disposed liquid wastes and to determine, if possible, the rate of underground water movement. Presumably it may prove possible to determine the "age" of water and thereby detect contemporary water in the presence of ground water. Cost, probability of success, preliminary equipment design, and safety of operation must be considered. For the purpose of detecting natural tritium in ground waters, it will be necessary to fabricate an electrolysis apparatus for electrolytic enrichment of the water sample and to develop equipment and technique for low background hydrogen counting. The cost of electrolysis and counting equipment including installation is estimated at $4500. The operating costs are estimated at $33.00 per sample, including labor, electrical power and miscellaneous cost. The time required for processing is about 8 days per sample. Proposed installation of electrolysis apparatus would be in 222-U with due consideration to space and power availability. Safety restrictions would possibly require installation of the electrolysis apparatus external to 222-U. No insurmountable technical obstacle is foreseen from this study. It appears that with only modest outlay of labor and material a valuable contribution can be made to the solution of the problem of ground water movement. (auth)

7364 ORNL-1378

Oak Ridge National Lab., Tenn.
GAS MASK CANISTER TESTS AGAINST RADIOACTIVE SULFUR DIOXIDE. J. W. Thomas. Sept. 2, 1952. Decl. Mar. 1, 1956. 16p. Contract W-7405-eng-26. $3.30(ph OTS); $2.40(mf OTS).

The application of radioactive gases to gas mask canister testing was investigated. Sulfur 35 was selected as the test isotope to avoid shielding problems, and was used to prepare SO_2 in curie amounts. The influent and effluent sulfur dioxide gas concentrations were measured with a flow-type ionization chamber equipped with vibrating reed electrometer and recorder. An ultra sensitive test was developed. Penetrations as low as 10^{-3} μg/l may be estimated. Results of several high-activity trial runs showed almost immediate penetration of the gas in very small quantities. Several interesting applications of the flow ionization chamber to canister testing are discussed. (auth)

URANIUM AND URANIUM COMPOUNDS

7365 AECD-3999

Sylvania Electric Products, Inc., Bayside, N. Y.
TEXTURES IN ROLLED URANIUM ROD. W. P. Chernock and L. W. Kates. Apr. 21, 1952. Decl. with deletions Jan. 5, 1956. 21p. Contract AT-30-1-Gen-366. $0.20(OTS).

The textures in a hot-pressed U rod were investigated after reductions of area were made up to 70%. The texture at 70% reduction of area could best be described as very close to an (041) fiber texture. (auth)

7366 AECD-4167

Hanford Atomic Products Operation, Richland, Wash.
EPI-CADMIUM FISSION IN U-235. E. D. Clayton. Mar. 7, 1955. Decl. with deletions Dec. 1, 1955. 29p. Contract W-31-109-eng-52. $0.25(OTS).

The fission resonance integral of U^{235} for epi-cadmium neutrons in a graphite–uranium lattice has been measured as, $\int_{0.49}^{2\ Mev} \sigma_F(E)\, dE/E = 271 \pm 25$ barns. This number was

obtained by comparing the cadmium ratio of a small U^{235} fission chamber with that of a BF_3 counter in six different exponential pile lattices. In addition, the results of a second method based on the use of standardized indium foils are given. The above integral is extended down to 0.17 ev by calculation and the value from 0.17 ev to 2 mev is given as, 443 ± 25 barns. It is concluded that the error is small in assuming U^{235} varies as 1/v for lattice calculations where a Maxwellian thermal flux with a 1/E tail is encountered. (auth)

7367 ANL-4905
Argonne National Lab., Lemont, Ill.
THE EFFECT OF CYCLING VARIABLES UPON THE GROWTH RATE OF 300°C ROLLED URANIUM. R. M. Mayfield. June 1, 1952. Decl. Dec. 10, 1955. 26p. Contract W-31-109-eng-38. $0.25(OTS).

The dimensional changes that result from thermal cycling 300°C rolled U in the α temperature range are believed to be the manifestation of intercrystalline stresses which produce plastic deformation. These dimensional changes vary widely with cycling variables, such as heating and cooling rates, temperature limits, temperature range, and holding time. The transfer times (heating and cooling rates) exert a marked effect upon the growth characteristics, other factors being constant. Slow heating combined with fast cooling produces maximum growth; minimum growth results from the use of a fast heating–slow cooling combination, and intermediate growths are obtained with equal heating and cooling times. Analysis of the temperature limits and temperature range effects, considered jointly, indicates that little growth results if the upper temperature of the cycling range is below 350°C. In general, above this limiting condition, the greater the temperature range (ΔT) the greater the resulting growth. For a given temperature range, the higher the temperatures (upper and lower limits) the greater the growth. A constant growth value may be approached with increasing temperatures under certain cycling conditions. The maximum amount of growth obtained is dependent upon the holding time at the upper cycling temperature. As the upper temperature increases, the time required to reach a constant growth rate decreases. (auth)

7368 ANL-5021
Argonne National Lab., Lemont, Ill.
PREPARATION OF ALPHA URANIUM SINGLE CRYSTALS. PART III. GRAIN COARSENING METHOD. Final Report. E. S. Fisher. Aug. 1954. Decl. Dec. 10, 1955. 89p. Contract W-31-109-eng-38. $0.50(OTS).

A large number of good quality single crystals were prepared by the grain-coarsening method. A number of ingots were rolled and swaged to small-diameter rods in order to study and compare their grain-coarsening tendencies. The effects of heat treatment and contamination on crystal production were also studied. Detailed summaries of the experiments and preparation methods are given. (B.J.H.)

7369 CU-107
Columbia Univ., New York.
REDUCED NEUTRON WIDTHS IN FISSION RESONANCES. D. C. Peaslee. May 20, 1952. Decl. Dec. 21, 1955. 8p. Contract AT-30-1-gen-72. $0.15(OTS).

An argument is presented that the effective level spacing D which determines the neutron half-width Γ_n of a nuclear resonance should be reduced by a factor $e^{-2\pi(\Gamma-\Gamma_n)/D}$ in comparison with the actual level spacing D, where Γ is the total half-width of the level. For the level to be distinguishable, $\Gamma < D$, so that the correction is important only in case $\Gamma_n \ll \Gamma \lesssim D$. This situation is approached in some low-energy resonances of U^{235} for which the fission width $\Gamma_f \approx \Gamma \gg \Gamma_n$. The reduction factor is applied to these levels and improves agreement of the measured parameters with the semi-empirical formula $\Gamma_n \approx (2/\pi)(k/K)\,D$. The resonance levels of U^{235} fall into three groups: one for which the reduction factor is relatively important; one for which it is not, although fission occurs in these levels; and a single additional level for which fission is absent. The first group is interpreted as comprising cases where the intermediate compound nucleus is only partially established, on the average, before fission occurs. The second group corresponds more closely to the usual picture of compound-nucleus formation with independent competing modes of decay. The most satisfactory explanation of the one non-fissioning resonance is to ascribe it to an impurity such as U^{236}. (auth)

7370 CU-123
Columbia Univ., New York.
THE ANOMALOUS 2.05 EV LEVEL IN U^{235}. W. W. Havens, Jr., E. Melkonian, and M. Levin. Jan. 15, 1954. Decl. Dec. 3, 1955. 14p. Contract AT-30-1-GEN-72. $0.15 (OTS).

The 2.05-ev level of U^{235}, seen previously only in total cross section measurements, has now been observed in fission. However, the level is predominantly capture, with $1 + \alpha$ equal to 7.2 ± 2.0. (auth)

7371 KAPL-M-WHH-1
Knolls Atomic Power Lab., Schenectady, N. Y.
SEMI-CONDUCTIVITY OF URANIUM DIOXIDE. William H. Howland and Leo F. Epstein. Mar. 6, 1952. 13p. Contract W-31-109-eng-52. $3.30(ph OTS); $2.40 (mf OTS).

The electric conductivity and activation energy of UO_2 was found experimentally from 30 to 1497°C and compared with values found in the literature. (F.S.)

7372 M-3049
[Chicago. Univ. Metallurgical Lab.]
THE DIRECT SPECTROPHOTOMETRIC DETERMINATION OF IRON IN URANIUM AND ITS COMPOUNDS. V. A. Fassel. Apr. 27, 1945. Decl. Feb. 13, 1956. 14p. Based on CC-460, CC-682, and CC-726. $3.30 (ph OTS); $2.40(mf OTS).

A direct spectrophotometric method for the determination of trace amounts of iron without the separation of uranium is described. The color formed by the ferrous-1, 10-phenanthroline complex is measured at a wavelength where interference of the yellow uranyl ion is a minimum. Recommended procedures for making quantitative calibrations and analyses are also given. A rapid method for the decomposition and solution of UF_4 is introduced. Data are also presented which indicate that the iron remaining in the acid-insoluble residue is negligible. Analytical results using the recommended procedure are also included. (auth)

7373 NAA-SR-Memo-199
North American Aviation, Inc., [Downey, Calif.].
THE RADIAL EXPANSION DUE TO THERMAL STRESSES IN A LONG URANIUM ROD. J. Brandstatter. Feb. 1, 1952. Decl. Apr. 11, 1956. 3p. $1.80(ph OTS); $1.80 (mf OTS).

The formulae for the radial expansion due to thermal stresses in a long U rod are derived. (B.J.H.)

7374 RL-4.6.931
[California. Univ., Berkeley. Radiation Lab.]
THE FLOW OF TCl_4 VAPOR THROUGH TUBES OF CYLINDRICAL CROSS-SECTION. P. H. Davidson. Aug. 28, 1945. Decl. Sept. 15, 1955. 10p. Contract W-7405-eng-48. $1.80(ph OTS); $1.80(mf OTS).

It has been shown experimentally that the flow of TCl_4

vapor through tubes of cylindrical cross-section can be estimated with fair accuracy by using the equation $Q/P_1 - P_2 = ap + b(1 + C_1P/1 + C_2P)$. The ratio of experimental to calculated rates is about 0.90 at 450°C and about 0.40 at 500°C. (auth)

7375 RL-4.6.933

[California. Univ., Berkeley. Radiation Lab.]

THE IODINE DECOMPOSITION PRESSURE OF TUBALLOY TRICHLORIDE–MONOIODIDE. P. H. Davidson, G. E. MacWood, and I. Streeter. Aug. 31, 1945. Decl. Sept. 15, 1955. 6p. Contract W-7405-eng-48. $1.80 (ph OTS); $1.80 (mf OTS).

The equilibrium iodine pressure above UCl_3I was determined by the effusion method between about 200°C and 300°C. From these data, the heat and change in free energy for the reaction, $UCl_3I(s) = UCl_3(s) + \frac{1}{2} I_2(g)$ was derived. (auth)

Refer also to abstract 7258.